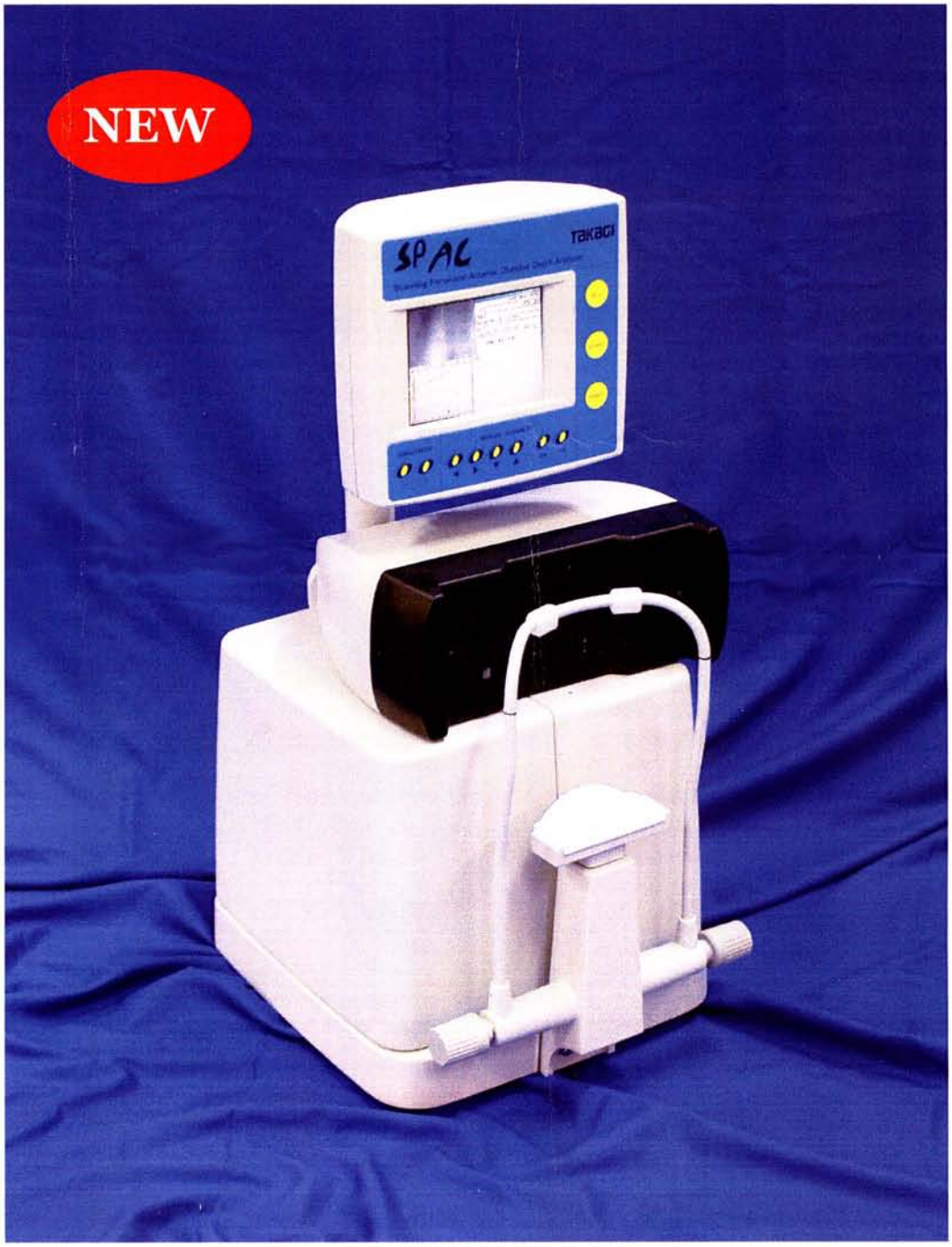
TAKAGI

Scanning Peripheral Anterior Chamber Depth Analyzer

SPAC

Glaucoma Screener



Aiming at new levels in quality

SPAC satisfies all requ

High reproducibility | **Non-invasive** | **Examinations not limited to ophthalmologists**

What is SPAC ?

SPAC evaluates non-invasively, quantitatively the anterior chamber depth consecutively from the pupil center to the limbus. It is intended to automatically evaluate the potential to develop angle closure glaucoma (ACG), i.e. to screen the ACG eye or the potential ACG eye. It also aims to assist routine medical examinations, by evaluating simply, quantitatively the anterior chamber depth change in various pathologies.

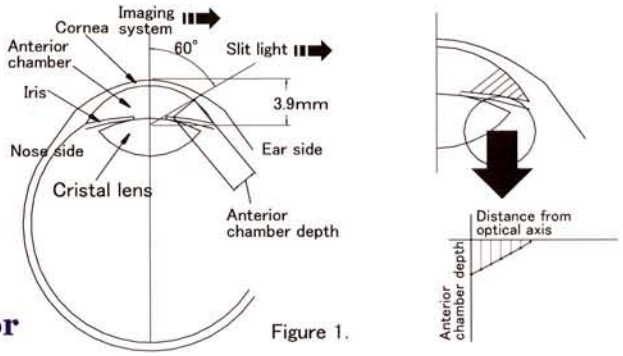


Figure 1.

SPAC is the following measuring methode for the anterior chamber depth

A slitlamp light for alignment is projected to the cornea of the subject eye, and the cornea top is detected, Then, the slitlamp light for measurement is projected to the cornea top from the ear side with an angle of 60 degrees. In order to obtain an image focused from the cornea to the iris, slit sectional images are intermittently acquired from the cornea to the irist, while moving the slitlamp light from the cornea center to the iris on the ear side, with a CCD camera synchronized with the slits on both sides based on Scheinpflug's principle. The acquired images are instantly analyzed, and the corneal radius of curvature and the distance from the corneal endothelium to the iris surface as an anterior chamber depth are displayed on the monitor. They can be printed using a built-in printer.

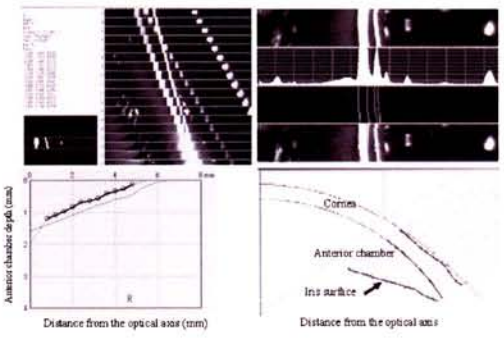
Why screening of Glaucoma is necessary ?

Examining the anterior chamber depth and the angle openness is extremely important for diagnosis and treatment of glaucoma, especially for angle closure glaucoma (ACG). In particular, angle closure glaucoma is one of the major causes that leads to blindness, and the incidence rate is high especially in Asian countries. Since angle closure glaucoma does not develope any symptons and maintains a normal intraocular pressure, it is rarely detected in routine medical examinations before onset. Once the attack has started, however, the visual function may be degraded in a very short period of time. The angle closure glaucoma attack can be protected by the protective peripheral laser iridotomy (PLI) in many cases, which means that the PLI prevents the ACG attack over a lifetime. Once the ACG attack has started, on the other hand, it has been reported that any medical treatment including PLI have an ineffective outcome; compared with the case that the protective PLI is applied in advance.

Difference from conventional methodes

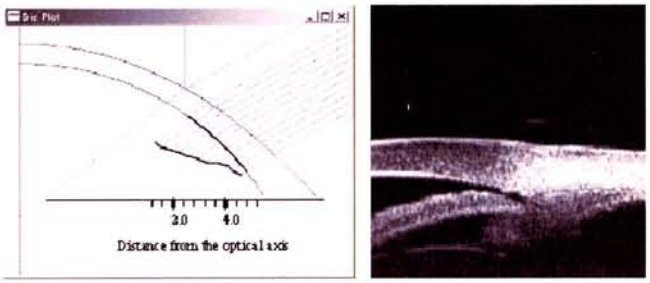
Gonioscopy and ultrasound biomicroscopy (UBM) are effective for the evaluation of angle, as well as diagnosis of angle closure glaucoma. With these methods, angle geometry can be observed, and quantitative examinations have been improved together with the measuring program recently developed. Thus, they seem to be the most effective examination method for diagnosis of angle closure glaucoma (ACG). On the other hand, they are invasive because of being a contact type. In addition, operation is extremely complicated that measurement accuracy would depend on the examiner's skill. Inter- and intra-examiner reproducibility is quite low. Operation is limited to ophthalmologists, and UBM is very expensive. Optical analyzers cannot measure the outermost peripheral area because of the influence of refraction, but measures only the apparent angle openness. Furthermore, even analyzers with a quantitative measuring program require a significant amount of work for judgment . SPAC has several correction programs to supplement the demerits of optical analyzers, and enables quantitative measuring without any contact. In addition, operation is not limited to ophthalmologists.

Figure 2. Representative SPAC Images *1



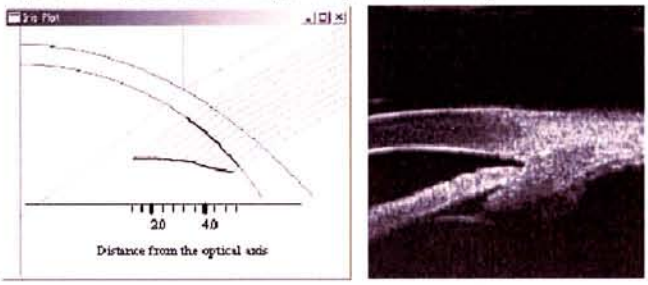
*1、*2、*3 provided by cortesy of Kenji Kashiwagi, MD, Department of Ophthalmology Faculty of Medicine Univeasity of Yamanashi, Japan

Figure 3. Representative Images of eye with narrow angle *2



SPAC UBM

Figure 4. Representative Images of eye with open angle *3



SPAC UBM

irements for screening Glaucoma

Easy operation

Unique programs enable quantitative examinations with a high degree of accuracy

Easy operation: Automatic alignment / Binocular examination / Display of measurement results

SPAC does not require any special skill. Once the start button is pressed, SPAC starts examination automatically. Screening of glaucoma becomes routine work; no longer limited to ophthalmologists.

START Press the "START" button to start SPAC

BInocular examination is complated in 30 seconds, and the result is displayed.

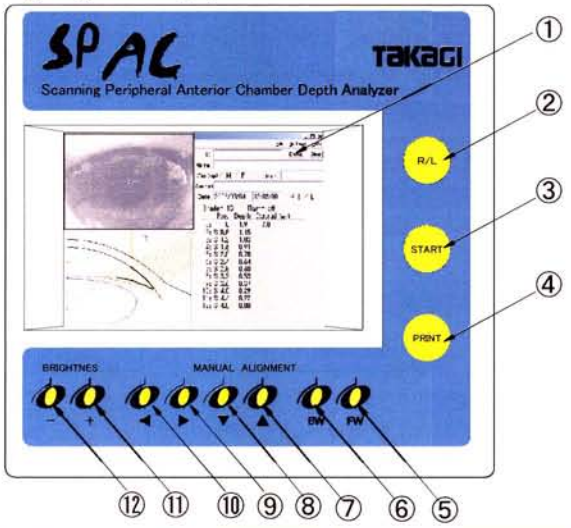
Set the subject's chin on the chin rest, and adjust the chin rest position vertically so that the subject eye is displayed on the monitor.

SPAC aligns the subject eye. ➡ SPAC measures the anterior chamber depth of the right eye. ➡ SPAC measures the anterior chamber depth of the left eye.

*** Monocular examination is also possible

The SPAC monitor displays the examination result and the judgment (refer to figure 6. Monitor/Operation panel).

Figure 5. Monitor/Operation Panel

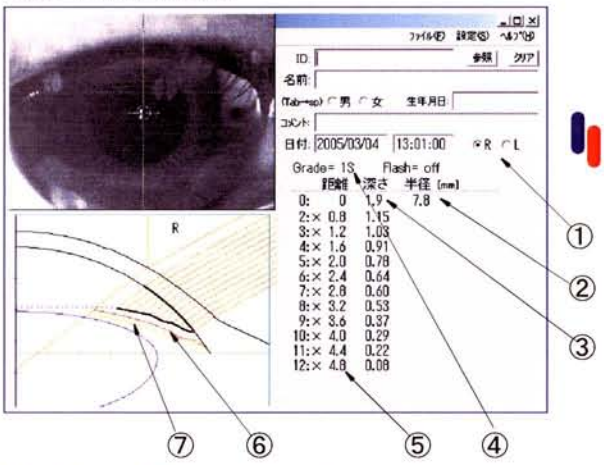


① LCD ---------- Displays the anterior are of the subject's eye and the measurement results.
② R／L ---------- Press to select the eye to be measured.
③ START ---------- Press to start automatic measurement.
④ PRINT ---------- Press to print out the measurement results.
⑤ FW ---------- Press to move the measuring unit forward for manual alignment.
⑥ BW ---------- Press to move the measuring unit Backward for manual alignment.
⑦ ▲ ---------- Press to move the measuring unit up for manual alignment.
⑧ ▼ ---------- Press to move the measuring unit down for manual alignment.
⑨ ▶ ---------- Press to move the measuring unit right for manual alignment.
⑩ ◀ ---------- Press to move the measuring unit left for manual alignment.
⑪ ＋ ---------- Press to increase brightness of the LCD.
⑫ － ---------- Press to decrease brightness of the LCD.

PRINT Press the "PRINT" button to print the examination result.

The built-in thermal printer prints out the examination result.
For the printout details, refer to figure 7. Sample printout

Figure 6. Monitor Layout



①Right eye/Left eye
②Corneal radius of curvature
③Anterior chamber depth
④Grade for assessment
⑤Distance from the optical axis
⑥Threshold for assessment:Suspect
⑦Threshold for assessment:Potential

Unique correction programs enable quantitative examination with a high degree of accuracy.

SPAC is a non-contact analyzer, adopting the optional examination system. With a conventional optical measuring system, the examination result cannot obtain accuracy due to the influence of refraction on the analysis. Unique correction programs eliminate such demerits of conventional optical examination systems, and enable an instant data analysis. In addition, the digital display of the examination result realizes a quantitative examination that was difficult with conventional examination systems. With this system, continuous follow-up of glaucoma patients can be performed easily.

Grading of assessment

SPAC categorizes the anterior chamber depth into 12 grades from Grade 1 (shallow) to Grade 12 (deep), and enables finer grading of the anterior chamber depth. Furthermore, the suffix attachment S (danger) and P (caution) to the Grade number represent the potential risk of angle-closure glaucoma. A through examination is strongly recommended when the suffix S (danger) or P (caution) is donated.

Sample Printout

①Corneal radius of curvature
②Anterior chamber depth
③Grade for assessment
④Distance from the optical axis
⑤Threshold for assessment: Danger
⑥Threshold for assessment: Caution

```
ID=
Name=
M/F=
Birth=
Comment=
Date=2005/03/04
Time=13:01:00
Grade=JS  Flash=off
Data:  Pos.   Depth  Cor.rad
          0    1.9     7.8
      s  0.8   1.15
      s  1.2   1.03
      s  1.6   0.91
      s  2.0   0.78
      s  2.4   0.64
      s  2.8   0.60
      s  3.2   0.53
      s  3.6   0.37
      s  4.0   0.29
      s  4.4   0.22
      s  4.6   0.08
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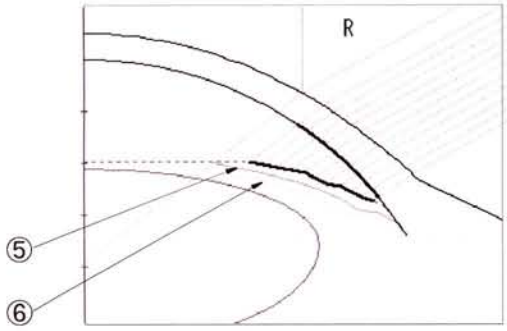

Figure 7.

Component names / Dimensions in mm

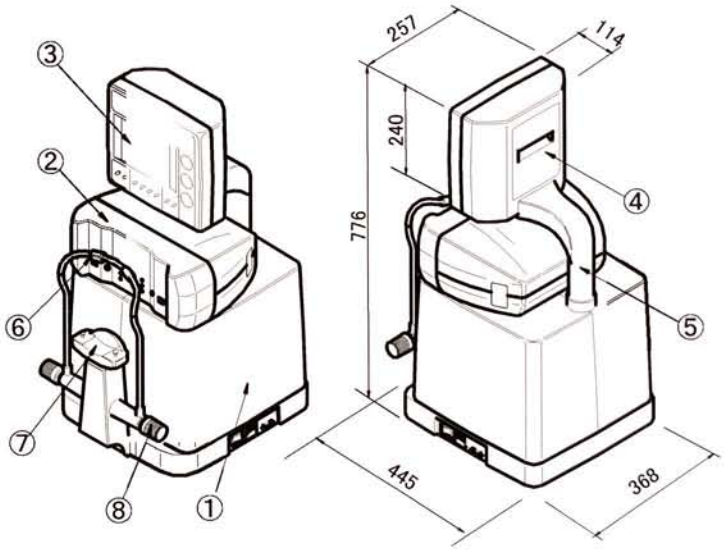

Figure 8.

①Base unit
②Measuring unit
③Monitor/Operation panel
④Printer
⑤Monitor arm
⑥Forhead rest
⑦Chin rest
⑧Chin rest adjusting knob

Specifications

◇Method : Optical method

◇Optical system

1) Slit projection optical system

・Projection magnification	: 1X
・Slit width	: 0.05mm
・Slit length	: 4mm
・Slit scan	: 8mm
・Elevation angle	: 60 degrees
・Light source	: 12V 30W Haloge bulb

2) Optical alignment system

・Projection magnification	: 1X
・Slit width	: 0.05mm
・Slit length	: 4mm
・Elevation angle	: 45 degrees
・Light source	: Infrared LED(875nm)

3) Recording optical system :

・Recording mafnification	: 0.4X
・Image sampling distance	: 0.4mm
・Camera	: 1/3-inch CCD camera (Monochrome)

◇Measuring unit

1) Traveling range

・Up/down	: 30mm
・Left/right	: 100mm
・Forward/Backward	: 40mm

◇Measuring items

1) Corneal darius of curvature

・Main meridian	: Center horozontal axis only
・Measuring range	: 6.5mm to 9.4mm
・Display unit	: 0.1mm
・Measuring time	: 1.7 seconds

2) Anterior chamber depth

・Measuring range	: 0 to 10.0mm
・Display unit	: 0.01mm
・Measuring time	: 0.7 seconds

◇Computer

・CPU	: 800MHz
・Memory	: 256MB
・Hard disk	: 30GB

◇Monitor : 6.5-inch LCD

◇Monitor arm

・Horizontal rotation	: 45 degrees left and right

◇Interface : USB x 1(4-pin)
: Mouse terminal
: Keyboard terminal

◇Power supply : AC100V to 230V
: 50/60Hz

◇Power consumption : 200VA

◇Weight : Approximately 30kgs

● Design and specifications are subject to change as improvements are made to the product.

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CE TÜV ISO 13485

B05003