

TONOMETER
MANUAL



RU-900



INSTRUCTIONS MANUAL

APPLANATION TONOMETER

INSTALLATION AND ASSEMBLY

INSTALLATION OF THE TONOMETER MODEL "RU-900" ONTO THE SLIT LAMP.



Remove the screw on the top of the slit lamp microscope head.
NOTE: underneath the screw is a spring, use caution when removing screw.



Slide the tonometer onto the mounting block post.
By rotating the instrument, the ball-bearing will be fixed into its 3 positions: in front to measure, and at both sides to operate the Slit Lamp.

Install the tonometer prism into its holder.



Attach the mounting block, with pin, on the microscope head.
Use the flat head screw (fine threaded) that is supplied.

WHEN NOT IN USE, REMOVE THE TONOMETER FROM THE SLIT LAMP AND KEEP IT IN YOUR PACKAGE.

INSTRUCTIONS FOR USE

Preparing the patient

1. Anesthetize both eyes. Both eyes must always be anesthetized to prevent movements of the lids during prolonged examination.
2. Place a fluorescein paper strip near the external canthus in the lower conjunctival sac in the same manner as for the Shirmers test. After a few seconds in which the lachrymal fluid is sufficiently colored, the paper can be removed.
3. The patient is asked to put his head on the chin and forehead-rest of the Slit Lamp.
4. Regulate the microscope height for a comfortable observation.

Preparing the Slit Lamp and the Applanation Tonometer

1. Before measuring, make sure that the eyepieces are correctly focused.
2. Bring the blue filter into the beam of the Slit Lamp and open the slit diaphragm completely. The angle between illumination and microscope should be about 60° so that the image appears bright and free of reflection.
3. Place the tonometer in the forward click stop position. Observation is always monocular with the left eye.
4. Clean the measuring prism with a disinfecting fluid that does not damage plastic. Afterwards dry with soft clean cotton.
5. Bring the pressure-arm into the notch position so that the axis of the measuring prism and the microscope coincide.
6. Set the measuring drum at a pressure of about 1 g. If the prism touches the cornea without any force being applied, the pressure arm will vibrate and this may be disturbing to the patient.

Instructions to the patient

1. The patient's head should be pressed firmly against the chin and forehead rest.
2. Instruct the patient to look straight ahead.
3. The patient is repeatedly asked to keep his eyes wide open during the examination. It is also recommendable when necessary that the examiner hold open the lids of the examined eye with his fingers provided that no pressure is applied to the eyeball.

Measurement

1. Immediately before measurement the patient should close his eyes for a moment so that the cornea is well moistened with lachrymal fluid and fluorescein.
2. By moving the Slit Lamp forward, the measuring prism is brought into contact with the center of the cornea on the pupillary area. On contact, the limbus of the cornea shines with a bluish light. This is best observed by the naked eye from the side opposite to the illumination. As soon as the limbus lights up, the slit Lamp must stop moving.
3. Only after contact with the cornea should then the microscope be used. The steady pulsation of the two fluorescein semi-circles, the size of which, at 1g, will depend on the intraocular tension, indicate that the instrument is in the correct position for measurement, Fig. 1. Any necessary correction has to be made by the joystick for height or lateral adjustment control of the Slit Lamp, until the flattened area is seen as 2 semicircles of equal size in the middle of the field of view, see Fig. 1. (Should this not be case, observe information under *Sources of error*.)
4. The pressure on the eye is then increased by turning the measuring drum on the tonometer until the inner borders of the two fluorescein rings just touch each other, in other words, when they overlap with each pulsation of the eye, Fig.2. The width of the fluorescein band around the point of contact of the measuring prism should be about one tenth of the diameter of flattening. (0,3 mm).
5. The reading is then made on the measuring drum of the amount of pressure applied. By multiplying this reading by ten, the intraocular pressure in mm Hg is found.

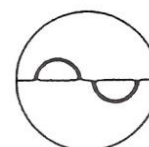


Fig. 1

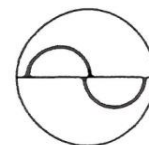


Fig. 2

Generalities concerning the measurement

Measurements can be repeated frequently. The first measurements of excited or nervous patient produce higher readings than normal. When the patient is aware that the procedure is not all that uncomfortable, however, the tension falls to the true value in less than a minute. With the eyes wide open and a good anesthesia the patient does not feel anything at all. Trial measurements should therefore be made on both eyes, the results of which are to be ignored. Three further measurements should then be made and the values obtained are correct if they remain within a range of 0,5 mm Hg. When measuring an eye for a prolonged period of time desiccation of the corneal epithelium may appear on both eyes. In the examined eye a ring shaped lesion appears which takes the fluorescein coloration around the zone of contact. This small disturbance does not harm the patient.

Whenever the other un-examined eye shows dried out patches in the epithelium which are stained fluorescein, it impedes an accurate measurement of the intraocular tension by means of Applanation tonometry. To avoid this condition, measurements should be made as rapidly as possible on each eye alternately. Although the above mentioned staining causes no harm or injury and disappears without any treatment, the visual acuity does in fact temporarily diminish by this medical intervention. A previous examination of the visual acuity and the measurement of visual fields should therefore be made before the Applanation tonometry measurements.

Astigmatism correction

If the cornea is spherical, measurements can be made on any meridian, but is most convenient to do it on the 0° meridian.

If the cornea is not spherical, the flattened area is not circular but elliptic. When eyes with higher corneal astigmatism than 3 diopters are examined, a correction is necessary. This is achieved by rotating the prism until its graduation shows the same value as orientation of the higher radius of the cornea that must coincide with the red mark on the prism holder.

Sources of error

Errors can occur under the following conditions:

1. If the fluorescein ring is too wide or too narrow.

Fig. 3: the fluorescein ring is too wide. Either the measuring prism was not dried after cleaning or the lids have come into contact with the prism during measurement. The pressure read from the drum will be higher than the real intraocular pressure. For correction the Slit Lamp has to be drawn back and the prism must be cleaned and dried with a piece of sterile cotton.



Fig. 3

Fig. 4: the fluorescein ring is too narrow. The lachrymal fluid has dried out during a prolonged measurement. The reading on the drum is lower than the actual intraocular pressure. The patient has to open and closed his eyes several times, then repeats the measurement to correct this error.

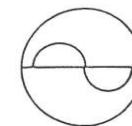


Fig. 4

2. If the measuring prism does not touch the cornea.

If the patient retreats slightly there will be irregular pulsation, because the measuring prism only temporarily touches the eye. If the patient retreats still further, the fluorescein ring will disappear completely.

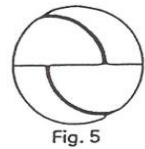


Fig. 5

Fig. 5: if the Slit Lamp is moved too far forward towards the patient or the patient moves, during measurement, towards the Slit Lamp, the pressure arm could push against the eye with a force up to 8 g. The flattened area will be too large. Turning the measurement drum scarcely changes the picture. Draw the Slit Lamp back until regular pulsation of a correspondingly smaller surface is seen in the correct measuring position and the change of pressure immediately alter the size of the flattened area.

3. If the two semi-circles are not in the middle of the field of view.

Fig. 6: the rings are too low. Correct with height adjustment control.

Fig. 7 and 8: the Slit Lamp has to be lowered and moved with the joystick to the left.

Fig. 9: The rings are too far to the right. Move the Slit Lamp by means of the joystick to the right.

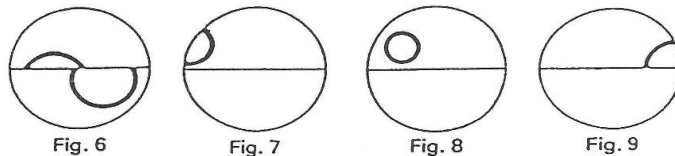


Fig. 6

Fig. 7

Fig. 8

Fig. 9

4. If the inner borders of the fluorescein rings do not touch each other.

Fig. 10: Here the outer border of the fluorescein rings touch. However, the inner borders do not touch, when they should in fact do so. Increase the pressure by turning the measuring drum.

Fig. 11: Here the inner border of one semi-circle touches the outer border of the other. Increase the pressure still more.

Fig. 12: The pressure has been increased too much. By reducing the pressure the circles will come together so that they touch each other correctly as in the Fig. 13.

Fig. 13: Correct final position (like fig. 2).

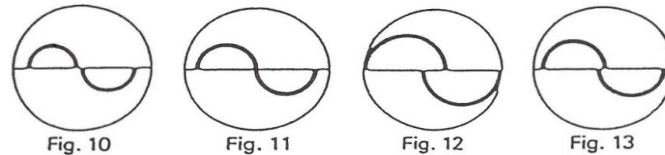


Fig. 10

Fig. 11

Fig. 12

Fig. 13

AMBIENT CONDITIONS

It is recommended that the following environmental conditions be observed during transportation, storage, and use of the Applanation Tonometer.

Transport and storage	Temperature	-10° C a +70° C
	Air Pressure	700 hPa a 1060 hPa
	Relative Humidity	10% a 95%
Use	Temperature	+10° C a +35° C
	Air Pressure	800 hPa a 1060 hPa
	Relative Humidity	30% a 75%

For transportation: remove the Tonometer from its mounting on the Slit Lamp, pack it in a suitable box and secure it with suitable packing material.

MAINTENANCE

To ensure the use of the equipment for several years, clean it weekly in the indicated manner. We recommend reviewing the equipment once a year by the authorized technical service

Verification: confirmation that the Tonometer adequately measures the force exerted by the counterweight must be done periodically by the user, at least once a month. For this verification the check weight that is given as accessory must be used (Fig. 14). It is advisable to reduce the periodicity of such verification depending on the frequency of use of the device, and it is recommended to carry it out if any anomaly is observed in its operation or in the indicated reading, if the device has received a blow or shows signs of damage or deterioration or if it is suspected that there may be.

To carry out the verification, use the bar as follows:

- with the bar held from its center and the drum marking “0”, the tonometer prism should remain vertical.
- with the bar held from the center mark and the drum marking “2”, the tonometer prism should remain vertical.
- with the bar held from the end mark and the drum marking “6”, the tonometer prism should remain vertical.

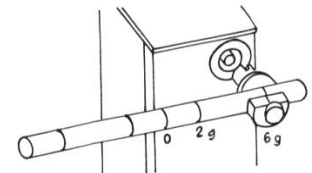


Fig. 14

In case of detecting that the instrument doesn't measure the suitable force by the verification bar, it is recommended to send the instrument to calibrate. This calibration must be carried out by authorized personnel from the technical service

Applanation Tonometers that need to be repaired and/or calibrated must be sent to the technical service of your Distributor

Cleaning:

Cleaning the body of the tonometer

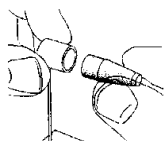
- Carry out manual non-immersion cleaning only, following the method described.
- Wipe the exterior surface with a clean, absorbent, lint-free cloth dampened with a water/detergent (2% detergent by volume) or water/isopropyl alcohol (70% IPA by volume) solution.
- Make sure the cloth is not saturated with solution.
- Surfaces should be thoroughly dried by hand using a clean, lint-free cloth.
- Dispose of used cleaning materials safely.

Disinfection of the tonometer cones

Always disinfect the tonometer cones **before use**.

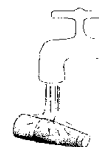
DISINFECT the cone according to the manufacturer's recommended cleaning method.

As a general recommendation, the following instructions can be followed:



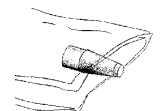
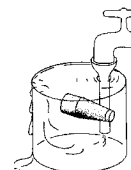
REMOVE THE MEASURING PRISM FROM HOLDER

THOROUGH CLEANING UNDER RUNNING (COLD) WATER
KEEP DURING 1 MINUTE



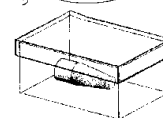
IMMERSE THE PRISMS INTO DISINFECTANT.
SEE INSTRUCTIONS ABOUT SPECIFIC DISINFECTANT.

CLEAN THOROUGHLY UNDER RUNNING (COLD) WATER
MIN. 10 – MAX. 30 MINUTES



DRY WITH A STERILE CLOTH

PLACE INTO STERILE STORAGE CONTAINER



RECOMMENDED PRODUCTS FOR DISINFECTION

1. - Hydrogen Peroxide. Concentration: 3%.
2. - Sodium hypochlorite (NaOCl). Concentration: 0,0525%.

Immerse 10 minutes at 20 °C
Immerse 10 minutes at 20 °C

Both products are effective against:

- bacteria
- tuberculosis
- fungi
- viral infections

DO NOT USE:

- **Alcohol content agents**
- **UV disinfecting**
- **Sterilization**
- **Temperature max. 60 °C**

ACCESSORIES

- A verification bar with fixing piece to the tonometer axis.
- Two Measuring Prisms

FEATURES

- * **Measuring range:** from 0 to 80 mmHg in 2 mmHg increments
- * **Accuracy:** ± 2 mmHg
- * **Diameter of the pneumatic face:** 3,06 mm

CONFORMITIES

The **RU-900** Applanation Tonometers are registered by Public Health Department of EEUU (F.D.A.) and comply with regulatory requirements established by the European Community (**CE 0318**).

SAFETY – WARNINGS AND CAUTIONS

The instrument should **ONLY** be used by qualified and specially trained personnel.

BEFORE each use, check whether the contact surface of the cone is damaged and discard it if any damage is noticed.

BEFORE each use, check that the cone to be used has been properly disinfected.

DISINFECT the cone according to the cleaning method indicated in this instruction manual.

There is a risk that the patient's cornea could be damaged if **the cleaning of the cones** is not done properly after the disinfection.

It is recommended **NOT TO USE** the cone if it is used **OVER TWO YEARS**, because after that time, it is possible that the fluids with the cone has come into contact have penetrated into its interior, leading to potential problems of contamination.

Repairs and calibration of this equipment should only be carried out by your dealer

Change the cone by other previously disinfected **BEFORE EACH USE**.

The owner of the instrument is responsible for training personnel in its correct use.

The estimated useful life for the Applanation Tonometer is 10 years.

