USER'S AND MAINTENANCE MANUAL
INTRODUCTION

The TONOLAB tonometer is used for intraocular pressure measurement (rat, mouse) in glaucoma research.

The TONOLAB is based on the patented rebound technology, which measures IOP accurately, rapidly and without the need of local anesthetic.

There is no risk of microbiological contamination, as single use probes are used in the measurement.

IOP changes due to the effects of pulse, breathing, eye movements, and body position. Because the measurement is made handheld in fractions of a second, six measurements are needed to obtain the final reading.

The TONOLAB has settings for rat and mouse.
SAFETY INSTRUCTIONS

Read this manual carefully, since it contains important information on using and servicing the tonometer.

- Keep this manual safe for future use.
- When you have opened the package, check for any external damage or faults. Check especially that the casing is not damaged. If you suspect that there is something wrong with the tonometer, contact the manufacturer or the distributor.
- Use the tonometer only for measuring intraocular pressure. Any other use is incorrect. The manufacturer cannot be held responsible for any damage arising from improper use, or for the consequences thereof.
- Never open the casing of the tonometer, except for the battery compartment or to change the probe base.
- The manual contains instructions for replacing batteries and changing the probe base.
- Never use the tonometer in wet place.
- The probe base, battery compartment cover, collar and probes are so small that a child or animal could swallow them. Keep the tonometer out of the reach of children or animals.
- Do not use the device near the substances that are flammable - including flammable anesthetic agents.
- Check that a clean new disposable probe is used before each measurement.
- Be sure that the probe contains the small plastic round tip in front.
- The tonometer must not come into contact with the eye, except for the probes for a fraction of a second during the measurement, therefore do not bring the tonometer into contact with the eye or push it to the eye (tip of the probe should be 1–4 mm or 1/8 inch from eye).
- The tonometer conforms to EMC requirements (IEC 60101-1-2: 2001), but interference may occur in it if used near to (<1m) a device causing high-intensity electromagnetic emissions (like a cellular phone). Though the tonometer’s own electromagnetic emissions are well below the levels in the relevant standards, they may cause interference in another device, e.g. a sensitive sensor, nearby.
- If the device is not to be used for a long time, removing the batteries is recommended, as the AA batteries may leak. Removing the batteries will not affect the subsequent functioning of the tonometer.
- Be sure to dispose of the single use probes properly (e.g., in a container for disposable needles), because they may contain micro-organisms from the measured patient.
- Batteries, packaging materials, and probe bases must be disposed of according to local regulations.
- Use adequate sedation to prevent the animal to lick or bite the tonometer or the probe.

PARTS OF THE TONOMETER
TURNING THE DEVICE ON

Insert batteries into the tonometer (page 7).

Fix the wrist strap onto the wrist strap attachment. Place the wrist strap around your wrist. The wrist strap will protect the tonometer from falling accidentally.

Press the measurement button in order to turn the tonometer ON. The tonometer display will display all of the LCD segments (see the image to the right).

The display will show “LoAd,” instructing the user to load the single use probe into the tonometer prior to measurement.

LOADING THE PROBE

Accurate measurement is guaranteed only when using probes made by Icare Finland Oy.

Open the probe tube by removing the cap and insert the probe into the probe base as shown in the image.

After the probe has been inserted, in order to prevent the probe from falling out, avoid pointing the tonometer downwards.

Activate by pressing the measurement button once. The display will show “00,” indicating that the tonometer is in starting mode and ready for measurement.

Following its activation, the probe becomes magnetized and will not fall out.

TO ACCESS THE STARTING MODE

Starting mode is displayed as “00”.

AFTER MEASURING  Press the measurement button.
BEFORE LOADING THE PROBE Press the selector button.

MEASURING INTRAOCULAR PRESSURE

Secure the subject and use enough sedation. Bring the tonometer near to the subject’s eye fixing the tonometer with hands and/or to some solid object.

The central groove should be in a horizontal position. The distance should be 1-4 mm (1/8 inch) from the tip of the probe to the cornea of the eye.

Measure takes place by lightly pressing the measurement button. The tip of the probe should contact the central cornea. Six measurements are made consecutively. Press the measurement button carefully, to avoid shaking the tonometer. After each successful measurement there is a short beep. After the six measurements, the IOP is shown on the display after the r (rat) or Π (mouse) letter (see p. 6 how to change the setup).

If there is an erroneous measurement, the tonometer will beep twice and display an error message (page 10). Press the measurement button to clear the error message. If several erroneous measurements appear, see the section “Error messages” (page 10).

Start new measurement by pressing the measurement button. The display shows “00” indicating that the tonometer is ready for the next measurement.

** IOP should always be measured from the central cornea to obtain the true value, since the result will vary in different parts of the eye.
MEASUREMENT READINGS ON THE DISPLAY

After the sixth measurement, you will hear a long beep and the letter “r” or “Π” will be displayed, followed by the IOP (Intraocular pressure) reading.

<table>
<thead>
<tr>
<th>ACTION</th>
<th>DISPLAY (the readings below are examples)</th>
<th>DESCRIPTION</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starting position</td>
<td>00</td>
<td>Tonometer is ready for measuring</td>
<td></td>
</tr>
<tr>
<td>1st measurement</td>
<td>1.15</td>
<td>Result of the 1st individual measurement</td>
<td></td>
</tr>
<tr>
<td>2nd measurement</td>
<td>2.16</td>
<td>Average of the 1st and 2nd individual measurements</td>
<td></td>
</tr>
<tr>
<td>3rd measurement</td>
<td>3.16</td>
<td>Average of the 1st, 2nd and 3rd individual measurements</td>
<td></td>
</tr>
<tr>
<td>4th measurement</td>
<td>4.17</td>
<td>Average of the 1st, 2nd, 3rd and 4th individual measurements</td>
<td></td>
</tr>
<tr>
<td>5th measurement</td>
<td>5.17</td>
<td>Average of the 1st, 2nd, 3rd, 4th and 5th individual measurements</td>
<td></td>
</tr>
<tr>
<td>6th measurement</td>
<td>r 17 OR Π 17</td>
<td>FINAL RESULT = average of 4 measurements, excluding the highest and lowest result</td>
<td></td>
</tr>
</tbody>
</table>

If the “r” or “Π” blinks when the final result is displayed, this means that the measurements’ standard deviation is greater than ideal.

<table>
<thead>
<tr>
<th>DISPLAY</th>
<th>DEVIATION</th>
<th>DESCRIPTION</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>r</td>
<td>No line, letter does not blink</td>
<td>≤ 1.0</td>
<td>No or insignificant deviation</td>
</tr>
<tr>
<td>r_</td>
<td>Line in lower position, the letter blinks</td>
<td>1.8 – 2.5</td>
<td>Slight deviation; the effect of the deviation is unlikely to be relevant to the result</td>
</tr>
<tr>
<td>r-</td>
<td>Line in the middle, the letter blinks</td>
<td>2.5 – 3.5</td>
<td>Deviation is clearly greater than normal, but the effect on the result will be insignificant in most cases</td>
</tr>
<tr>
<td>r°</td>
<td>Line in upper position, the letter blinks</td>
<td>&lt; 3.5</td>
<td>Deviation is too great</td>
</tr>
</tbody>
</table>

ACCESSING OLD MEASUREMENT RESULT

The tonometer’s memory stores 10 last measuring results.

1. From the starting mode (“00”; to access starting mode, see page 4), press the right or left selector button until “Old” appears on the display.
2. Press the measurement button. ‘Scroll’ the old values by pressing the selector buttons (right=older, left=more recent, from 0-9).
3. To exit the ‘old values search’, press the measurement button.
4. The display shows “Old”. Press either selector button to access other functions (00=measurement, End=turning OFF).

TURNING THE TONOMETER OFF

1. From the starting mode (“00”), press either selector button until the display shows “End”.
2. Press the measurement button for two seconds. The display will show “byE” and the tonometer will switch off. The used probe will be partly ejected.

Use the empty probe tube to remove the used probe from the tonometer. Ensure that you dispose of the probe properly.

The tonometer will automatically turn off if not used for two minutes.
CHANGING THE SETTING FOR DIFFERENT SPECIES

The TONOLAB tonometer has rat and mouse measurement settings.

\[ r = \text{rat} \]
\[ \Pi = \text{mouse} \]

Change the setting:

1. Press the right or left selector button until the display shows "End".
2. First press the measurement button, keep it pressed down and immediately press the right selector button. These buttons must be pressed down at the same time. The display will show "CAL" (or software version).
3. Press the measurement button.
4. Toggle between settings, using the selector button.
5. Choose the setting and activate by pressing the measurement button.

REPLACING THE PROBE BASE

During the use some dirt may collect in the probe base, affecting the probe movement. The probe base should be replaced every 12 months or if the probe no longer moves smoothly or the probe base error (E 01 or E 03) is displayed.

1. Unscrew the probe base collar.
2. Remove the probe base by tilting the tonometer downward and pull the probe base out of the tonometer.
3. Put a new probe base into the tonometer.
4. Screw the collar in, to lock the probe base.

**NOTE**  The probe base should be replaced with a new probe base every 12 months, or if the cleaning is not effective.

CLEANING THE PROBE BASE

The probe base should be cleaned every 6 months. The probe base can be reused after careful cleaning. Make sure the probe base is completely dry before using it.

1. Unscrew the probe base collar and remove the probe base from the tonometer.
2. Soak the probe base in 100% pure alcohol for 5 to 30 minutes.
3. Remove the probe base from alcohol and dry carefully by blowing clean canned or compressed air into the probe base. This will additionally remove possible residual dirt.
4. Insert the completely dry probe base and screw the collar back to the tonometer.

**NOTE**  Do not use water or soap solution to clean the probe base.

CLEANING THE TONOMETER SURFACE

The tonometer may be surface-cleaned using a soft cloth dampened with either a commercial, nonabrasive cleaner or a solution of 70% alcohol in water.

Lightly wipe the surfaces of the tonometer and make sure surfaces are dry after cleaning, especially areas near the main buttons, the display and the probe cover.

Chemical resistance to the following liquids has been tested:

- Ethanol
- 2-propanol
- Mild soap solution
- 95% Pursept solution

**CAUTION**  Do not spray, pour or spill liquid onto the Icare tonometer, its accessories, connectors, switches or openings in the chassis.

Do not leave the surface of the tonometer wet; dry it with a soft cloath.

The probe holder/base has to be removed from the tonometer to be cleaned.
REPLACING THE BATTERIES

Replace the batteries when the <bAtt> message is displayed.

1. Unscrew the battery compartment locking screw with a screwdriver or a small coin.
2. Remove the battery compartment cover.
3. Remove the old batteries.
4. Insert new AA batteries into the tonometer according to the small diagrams inside the battery compartment. The terminals should point downwards on the display side and upwards on the measurement side.
5. Replace the battery compartment cover and secure it in place by lightly screwing it shut with a coin or screwdriver. Be careful not to use excessive force when screwing the cover into place.

NOTE Use only alkaline batteries.

ERROR MESSAGES

Press the measuring button to clear the error message, and continue measuring.

<table>
<thead>
<tr>
<th>MESSAGE</th>
<th>STATE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>bAtt</td>
<td>The battery power is low.</td>
<td>Replace the batteries.</td>
</tr>
<tr>
<td>E 01</td>
<td>The probe did not move at all.</td>
<td>If this error message is repeated, turn the tonometer so that the collar faces downwards for a short time. If the error message still appears, take out the probe and replace with a new one. If the error message continues to appear, replace the probe base.</td>
</tr>
<tr>
<td>E 02</td>
<td>The probe did not touch the eye.</td>
<td>The measurement was made from too far away, or the probe base is dirty.</td>
</tr>
<tr>
<td>E 03</td>
<td>The probe speed was too low.</td>
<td>The measurement was made from too far away, or the tonometer was tilted too far upwards.</td>
</tr>
<tr>
<td>E 04</td>
<td>The probe speed was too high.</td>
<td>The tonometer was tilted downwards. Make sure that the groove is in the horizontal position.</td>
</tr>
<tr>
<td>E 05</td>
<td>The hit was too “soft”.</td>
<td>The probe hit the eyelid.</td>
</tr>
<tr>
<td>E 06</td>
<td>The hit was too “hard”.</td>
<td>The probe hit the opening eyelid or calcification in the cornea.</td>
</tr>
<tr>
<td>E 07</td>
<td>“Bad bounce”.</td>
<td>The probe did not hit the central cornea.</td>
</tr>
</tbody>
</table>

TROUBLESHOOTING

<table>
<thead>
<tr>
<th>VISUALLY INSPECT THE COVERS/ HOUSING OF THE DEVICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cracks/damage detected</td>
</tr>
<tr>
<td>The covers are not correctly in place, the cover(s) are loose.</td>
</tr>
</tbody>
</table>

LOAD THE PROBE AND MAKE A MEASUREMENT

<table>
<thead>
<tr>
<th>Display Issues</th>
<th>No digits on the display. A beep can be heard.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Some segments on the display are dead or fading.</td>
</tr>
</tbody>
</table>

Audible Issues

| A beep cannot be heard when the measurement button is pressed. |
| The frequency of the beep varies. |

Button Issues

| The device does not react when the buttons are pressed. |
| A button needs to be pressed hard for the expected function to work. |
| Some buttons react only occasionally. |
ERROR MESSAGES

- Replace the batteries when the <bAtt> message appears (page 7).
- Change or clean the probe base if the probe does not move smoothly (page 6).
- The device can be cleaned with a damp cloth containing disinfectant, according to the instructions (page 6).
- No other service procedures can be carried out by the user. All other servicing and repairs must be carried out by the manufacturer or a certified servicer.

TECHNICAL INFORMATION

Type: TV02.
Dimensions: 13 – 32 mm (W) × 45 – 80 mm (H) × 230 mm (L).
Weight: 155 g (without batteries), 250 g (4 x AA batteries).
Power supply: 4 x AA batteries.
Measurement range: 1-99 mmHg.
Accuracy of display: ±1.
Measurement accuracy: ±2 mmHg (5-30 mmHg), 10% (30-80 mmHg).
Display unit: Millimetre mercury (mmHg).
The serial number is on the back of the battery compartment cover.
There are no electrical connections from the tonometer to the patient.
The device has B-type electrical shock protection.

- Operation environment:
  - Temperature: +10 °C to +35 °C
  - Relative humidity: 30% to 90%
  - Atmospheric pressure: 800 hPa – 1060 hPa
- Storage environment:
  - Temperature: -10 °C to +55 °C
  - Relative humidity: 10% to 95%
  - Atmospheric pressure: 700 hPa – 1060 hPa
- Transport environment:
  - Temperature: -40 °C to +70 °C
  - Relative humidity: 10% to 95%
  - Atmospheric pressure: 500 hPa – 1060 hPa

WARNING  No modification of this equipment is permitted
**SYMBOLS**

- Caution, Attention!!!
  See instructions
- Lot number
- Do not dispose of in household waste
- Serial number
- B-type device
- See operating instructions for more information
- Single use only
- Manufacturer
- Temperature limitations
- Keep dry

**SPARE PARTS AND SUPPLIES**

- Probes in single use package.
- Probe base replacement kit.