



EASYTECH

Tonometer Intraocular Pressure





Tonometer Intraocular Pressure

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Tonometer Intraocular Pressure

Description

The tonometer intraocular pressure EZTN-01 is intended to measure the actual pressure and tonometry Intraocular through the eyelid 5 to 60 mm Hg in adults and children without using anesthetics and it can be used in medical centers and at home.

⚠ Not indicated:

- Pathological states of the upper lid (inflammatory diseases, scars, eyelid deformation).
- Pathology expressed sclera and / or conjunctivitis in the measurement area.

Technical information

Overall dimensions are not more than 176x26x20 mm.

Weight with batteries up to 88 g.

Climatic conditions of operation:

- air temperature from +10 ° C to +35 ° C;
- relative air humidity up to 80% at a temperature of + 25° C

Tonometer power is supplied with 2 AAA batteries 1.5 V (each)

The working capacity of the tonometer is ensured at 3.3 V (full charge) to 2.0 V (low charge)

When measuring pressure in the range from 5 to 26 mm Hg the absolute error measurement is ± 2 mm Hg. Measuring pressures from 26 to 60 mm Hg the relative error measured is about 10%.



Tonometer Intraocular Pressure

Maximum consumption current in the off state 30 μ A,

In the switched-on state in the "Waiting" mode 4 mA

In measurement mode 60 mA

The time of one measurement is not more than 2 s.

External surfaces of the tonometer are resistant to chemical disinfection using any anti-bacterial or sanitizing method.

In the calibration mode of the real IOP (Goldmann) can measure between 10 to 22 mmHg and can vary +/- 2 mm Hg.

Operation Principle

Intraocular pressure (PIO hereinafter) is manifested by stiffness (elasticity or hardness) of the eyes. In ophthalmology it is known that the eye is more rigid, higher PIO. To determine the elastic characteristics of the eyes used as a static measurement impact (flattening or indenting), both the dynamic impact - Tonometers rebound and air jet gauges. The principle of measurement with EZTN-01 simultaneous based on the use of two types of impact measurement -Static and Dynamic. Both impacts are realized in the eye through the eyelid with the vibration shaft.

The static effects to impact throughout the measurement time and determined by the vibrator weight. The dynamic impact is an impact vibration with a frequency of about 150 Hz and the amplitude of some hundredths of a millimeter and has a smooth tactile feel vibration. The vibrator shaft is elastically movable in the axial direction and is brought to oscillate by electromagnetic.

The external appearance of the tonometer is represented by the images below:

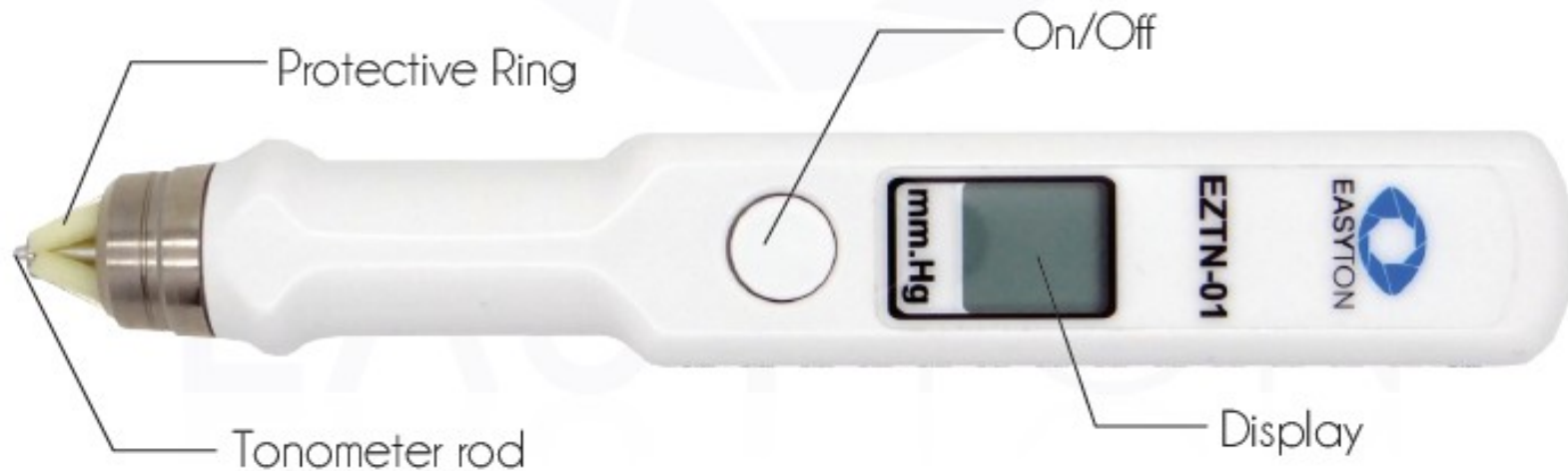


Image 1

Components Tonometer


The set includes:

Intraocular pressure tonometer EZTN-01	1 unit
Cover	1 unit
Control device	1 unit
Box	1 unit
AAAA 1.5V batteries	2 unit
USB flash drive with digital instruction manual	1 unit
Ophthalmic ruler	1 unit
Consumer Case	1 unit

Note - is admitted providing other types of power source elements (cells) with the same parameters as the dimensions and voltage.

Symbols

Tonometer in the following symbols are marked:

 The symbol indicates the need to consult the instruction manual, according to IEC 60601-1: 2005. This symbol indicates warning related to the safety and efficiency of use of the product.

 Functional type of B.

This symbol indicates that the functional part of the device is manufactured to type B IEC 601-1-88 on the degree of protection against electric shock.

Proper Use

Preparation of the tonometer to operate.

After prolonged storage or transport at a temperature below + 10 ° C keep the unit in an environment with a temperature between 10 to 35° C for at least 4 hours.

If necessary, disinfect the outer surface of the plastic protection Tonometer twice with a cotton cloth or gauze soaked in a disinfectant solution. During treatment the cloth should be well drained to prevent penetration of the disinfectant solution into the unit.

Immediately before measuring the metal of Tonometer surfaces that come in direct contact with the patient's eyelid should be disinfected (the tonometer rod and protection ring). For this purpose it can be used a cloth soaked in a disinfectant solution.

Order of work with tonometer

Before measuring the tonometer should be removed from the box and then turning the rod up, the protective cover must be removed. The binding of tonometer is performed by briefly pressing the on / off button. When you turn the tonometer, generates an audible signal and a visual signal of readiness for measurement via a mobile arrow on the display.



Image 2




Tonometer Intraocular Pressure

The symbols **M** and **G** in the upper right of the display indicates the current measurement mode field:

M -PIO Tonometry (According Maklakov with the force of 10 gr for the eyes)

G - real PIO (According Goldmann)

The state of power supply is indicated in the upper left corner with the symbol that gently changes from 3.3V to (fully charged batteries) up to  2.0V (fully discharged batteries).

Immediately before measuring the intraocular pressure (IOP) (with power on) is required to put up for measuring rod eye lid in the area of the cornea or sclera recommended or desired site (initial measurement).

Next you need to download the device gently 2-3 mm. It triggers the dynamic impact that feel a small vibration (operational phase measurement). During the measurement it is necessary to ensure that the protection ring does not touch the eyelid and is 2-3 mm above it.

The images below shows the initial and measuring the operational phase.



Image 3

Image 4

After a second later to download the tonometer will beep indicating the completion of the measurement and displays on the display the measured value of IOP. However, the measurement will be continued without interruption until the device does not get up. For the measurement, it is necessary to increase gradually the device. The measured value remains in the display until you turn off the unit or until a new measurement. The shut down of the device is performed by briefly pressing the On / Off button.



1-Ready
measurement



2-Mode
measurement



3-Measurement
finished

The states of the tonometer's display in different operating modes are shown in the previous image.

The ability of the apparatus to continuously measure the IOP provides effective learning work with. According to statistics, handling experience with this device is acquired after 10-20 minutes of training with mass measurements. The test can be done at the tips of the fingers themselves.

The tonometer has the ability to make measurements at any accessible point of the sclera or cornea of the eye through the eyelid, however, are recommended and comfortable measurement points for both the physician and the patient.



Image 6



Image 7

The main conditions that ensure the measurement accuracy:

- Perpendicular position in placing the appliance stem relative to the eye's surface;
- Vertical device placement;
- Smoothness and precision of movement during measurement (uniform speed of movement of about 2 cm per second. The requirement for smoothness and precision of movement is easily achieved with the support of the hand holding the tonometer head (forehead) of the patient).

The perpendicular placement of the appliance stem relative to the surface of the eye is an important condition. To achieve the squareness in the device placement is necessary to combine the tonometer rod axis with the geometric center of the eyeball.



Image 8



Image 9

The vertical placement of the apparatus is also an important prerequisite. Especially in the learning period and the early stages of working with the machine. During the measurement at this stage it is necessary to maintain an angular deviation from the vertical greater than 15 degrees, paying greater attention to the squareness of the scarifier. With experience gained handling, the vertical deviation angle can reach 30 degrees without decreasing measurement accuracy.

The IOP measurement can be performed in sitting or lying position of the patient. The necessary condition is that the position of the patient's head should be as horizontal as possible.



Image 10

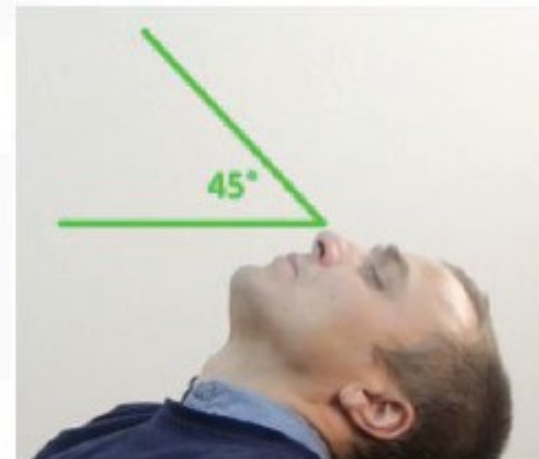


Image 11

PIO Measurement Methodology

- Take the tonometer of the box;
- Turn the tonometer with the stem up and remove the protective cover;
- Turn the tonometer with a short press of the On / Off button. Make sure the tonometer's readiness for operation via the mobile arrow on the display;
- Check the performance of the tonometer in the control device;
- Perform disinfection of the vibrator shaft and the protective ring with a cloth soaked in a disinfectant solution;
- Hold the tonometer with the fingers on the cylindrical part, as described in the images. Place the tonometer with the measuring rod down, and orient the unit so that the display is visible;
- Put laterally behind the patient as is shown in the form of images used.
- Focus and fix the gaze of the patient with a test object (eg with the patient's hand) so that the line of his gaze is approximately a 45° - 50° angle, as



Image 12

- Flatten the upper eyelid with the finger of free hand so that the edge of the upper eyelid coincides with the limb (image 13). Keep the lid in this position. It may not be the movement of the eyelid on the cornea at the time of measurement! Do not apply pressure on the eyeball;



Image 13

- The area of the tonometer rod action should be in the area of sclera corresponding to cornea ciliary of the meridian 12 hours.

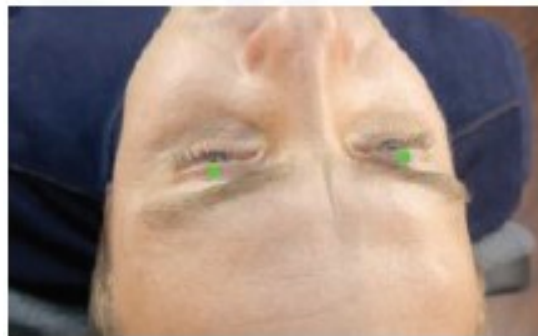


Image 14



Tonometer Intraocular Pressure

Gently place the rod device on the eyelid to 2-3 mm from the eyelid edge above the upper limit of the iris (**the fold of the eyelid behind roller eyelashes**). Recommended points of device placement are marked blue in the image 14;

- Keeping Tonometer upright, **gently** lower the unit to 2-3mm. It triggers the dynamic impact that feel a small vibration. During the PIO measurement is necessary to control the protection ring does not touch the eyelid and is 2-3 mm above the eyelid. **In the event of Tonometer download to an unacceptable low level, it sends an alarm signal, which automatically turns off when climbing the tonometer to an operational height;**
- After 1-2 seconds after the download Tonometer, it emits a beep indicating the completion of the measurement. To end the measurement is necessary to increase **gradually** the device. At the end of measurement emits another beep and the tonometer's display shows the measured value of IOP;
- In case of absence of the beep or delay the issuance of the sound signal for more than 3 seconds, repeat the measurement;
- The tonometer turns off by briefly pressing the On / Off button;
- After switching off, you need to put the protective cover after turning the tonometer with the stem up and put it in the box.

Warning: In case of unstable position of the eyelids or the eyes of the patient during measurement indicating the result of measurement is possible in a quadrangular symbol. In this case it is necessary to repeat the measurement.

Changing the metering mode Tonometer

The EZTN-Tonometer 01 can perform the measurement of the IOP in two ways:

- Real PIO measurement mode (Scale Tonometer Goldman);
- PIO measurement mode tonometry with the force of 10gr. (Tonometer scale of Maklakov).

The current measurement mode is indicated by a symbol in the upper right of the display (Figure 2). The actual pressure measurement mode is indicated by the symbol **G** and the measurement mode tonometry pressure is indicated by the symbol **M**.

Initially defined by the manufacturer measurement mode of tonometry pressure (according to Maklakov).

The measurement mode setting remains until the next change. Switching off the power supply does not change the default metering mode.

Changing the metering mode can be made at any time for this:

- Turn the tonometer with a short press of the On / Off button;
- Indicating the moving arrow on the display, press and hold for about 5 seconds the On / Off button until you see the automatic change of the measurement mode and get off the tonometer;

- Release the On / Off button;
- Turn the tonometer again and make sure the changes made in measurement mode;

Security measures

- Make sure that there is no mechanical damage to the tonometer and its stem. In the presence of damage its use is **PROHIBITED**;
- Protect Tonometer shakes and shocks. When you transport the tonometer, put it in the box already with the protective cover previously placed in the operative part;
- Do not allow moisture to penetrate inside the tonometer. If inside the unit into liquid, keep the tonometer for at least 4 hours at room temperature before you start using it and check its performance by measuring the pressure control device;
- Avoid high temperatures;
- Avoid sudden temperature changes. This may cause malfunction of the tonometer;

ATTENTION! Remember that excessive mechanical impact of the rod to the eyeball can cause the onset of painful sensations in the form of peaks patient and can lead to an undesirable situation for the measurement procedure of the patient's reaction.

REMEMBER IF! The appearance of an exclamation mark on the display or emission of a continuous beep indicate the non-operational state of the tonometer and the pressure of the rod above indicated to the eyelid in which the measurement is made.

Maintenance

	Maintenance Title	Periodicity
1	Preventive check	At least once a day
2	Cleaning the dust and dirt	Whenever necessary
3	Checking operation	Before each measurement of intraocular pressure
4	Replacement of power supplies	If the battery symbol appear on the display

When performing preventive check, pay attention to the integrity of the tonometer and mechanical damage of the vibrator shaft.

Perform the check operation of the tonometer according to the methodology described in chapter OPERATION CHECKING THE CONTROL DEVICE.

Technical Assistance

General Information

Technical assistance of the tonometer makes up in service centers or the manufacturer.

The malfunction indications are:

- Mechanical damage to the tonometer and (or) of the vibrator rod;
- The values shown by tonometer in the control device use are different from the values given in chapter

TECHNICAL DATA for more than 2 mm Hg;

- No indication of damage to the display with the characteristic sound of the rod vibration;
- No indication of symbols voltage level of the power supply.

Security measures

No special security measures during the course of the tonometer of repairs.

Replacing the Power Supply Elements

We need to replace the power of the elements when there is a battery voltage down to a level below 2V. The power voltage indicator in the upper left corner tonometer's display (see image 15) reports on the state of food elements.

When the battery voltage is more than 3.2 V, the indicator has the appearance shown in image 15a. In the image 15b is demonstrating the appearance of the indicator with the highest supply voltage of 2.8 V. With the lowering of the voltage of the batteries below 2 B the indicator is to look shown in the image 15c.

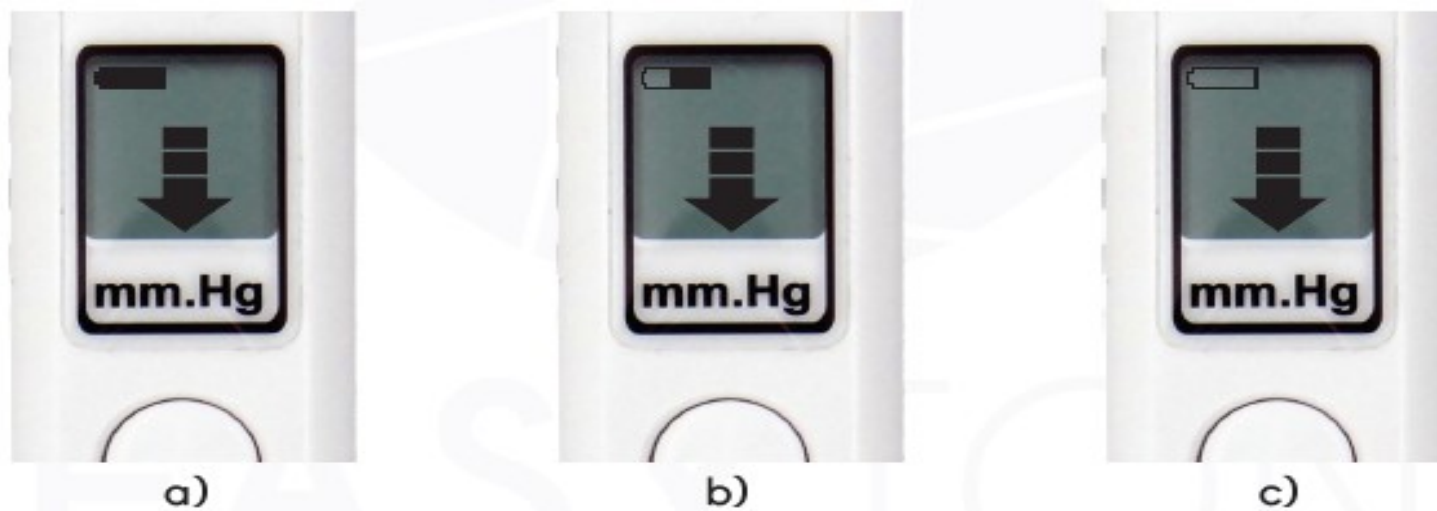


Image 15

The replacement of the power elements should be performed with off Tonometer.

To replace the power of the elements you need to open the battery compartment cover (see image 16a). The lid opens by moving in the direction of the arrow shown on the cover OPEN. The correct orientation of the power elements is shown in the images 16a and 16b.

On the board under the power of the elements marking is also placed to the correct orientation of the batteries.



Image 16A

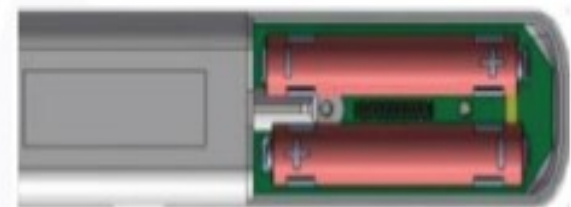


Image 16B

It is practical effect the removal of the feeding elements out of the brackets with the help of a plastic ruler or wood, or using it for the battery cover.

To insert the batteries you need to put them over the media, properly orienting the batteries according to the polarity of the connection and fasten them with light pressure until it clicks into place within their brackets.

After inserting the batteries, put the battery cover correctly, for this:

Gently close the battery compartment with the cover so that the slots of the cover and its coincide compartment.

When properly installed, the battery cover can effortlessly slide along the tonometer;

Making light pressure on the end cap, effortlessly move it in the direction of close to the end;

Visually control the angular edges of the cover stay in front of the slot openings in the grooves of the cover;

WARNING: After installing the tonometer power elements with brief pressure on the On / Off button. With this action there is the proper placement of the feeding elements and the tonometer is placed in microconsumer scheme.

Possible Problems and Methods of Resolution

Malfunction	Possible cause of the malfunction	Solving methods of the problem
The tonometer does not care	The power elements (cells) They are discharged.	Replace the elements of feeding.
	The power elements (cells) They are not placed correctly.	Placing the power elements correctly.
	Isolation of contact elements feed	Replacement power elements. Clean the contacts of battery holders.
	On / Off button damaged	Repair in service centers.
	Tonometer broken	Repair in service centers.
Os dados do Tonômetro obtidos no dispositivo de controle diferem dos indicados pelo manual em mais de 2 unidades.	The operation of the tonometer is verified an incorrect way.	Get stable skills of handling Tonometer in accordance control device with the foregoing in OPERATING CHECKING Tioring THE CONTROL DEVICE
	The tonometer is uncalibrated	Calibrating the service center.
	Tonometer broken	Repair in service centers.
Depois da medição (ao subir o Tonômetro) o impacto de vibração não para ou para com um atraso significativo (superior a um segundo).	The rod movement sensor is uncalibrated	Calibration in service centers technique.

<p>When you turn the tonometer, there is no indication on the display and is a beep alarm.</p>	<p>The display tonometer it's damaged.</p>	<p>Repair in centers technical assistance.</p>
<p>Power batteries up Unloading very fast</p>	<p>Power consumption It is deregulated.</p>	<p>Repair in centers technical assistance.</p>

Check the Operation of the Tonometer Control Device

Check the operation of the tonometer for control device must be made at least 1 time per week, as well as after long periods of work, the appliance falls and whenever there are doubts about the proper functioning of Tonometer.

Also carries out work with the control device for training to use the appliance.

The work with the control device takes place according to the following methodology:

Open the box Tonometer

- Turn the tonometer with a short press of the On / Off button.
- Check operation of the device through the movements of the arrows.
- Place the unit with the rod down, so that the display visible to you.
- Place the tonometer vertically with the rod over device control. The base of the palm holding the tonometer should lean on the table surface.



WARNING: The vertical position of the tonometer must be kept during any measurements with the tonometer.

- With a smooth flick of the wrist (without taking the palm of base table surface) gradually lower the unit with the rod to central control device hole, inserting into the order the Tonometer protection ring to the annular groove of the available device control. The background of the protection ring must match the closer the ring plane of the slot. With this, it activates the measurement mode that is felt by the hand through a slight vibration. The metering mode is also accompanied by pressure indication in the tonometer's display.

- Keeping the tonometer in this position, note the digital pressure value indicated on the display tonometer. The metering mode is activated by lifting the tonometer up control device. The digital value indicated on the display must not differ by more than two units indicated in the chapter TECHNICAL DATA of this Instruction Manual;
- Gently lift the tonometer up control device. Thus, the measurement mode ends and the tonometer's display is fixed to the measured value;
- The measurement mode may be repeated several times;
- Turn off the tonometer by briefly pressing the On / Off button;
- After turning the tonometer with the stem up, put the protective cap and replace the device in the box;



Image 21



Image 22



Image 23



Tonometer Intraocular Pressure

Storage and transport

The tonometer can be stored in unheated ambient and closed at a temperature of 40 ° C to + -50C° and 98% relative humidity until the temperature is + 25 ° C.

The tonometer can be transported by any means of transport in closed microclimate zones with moderate climate and cold -50 ° C to room temperature to + 50°C.



Tonometer Intraocular Pressure

Manufacturer Warranties

The manufacturer guarantees the conformity quality Tonometer the quality requirements set out in the Instruction Manual provided prenatal care for storage, transport and handling specified in this Instruction Manual.

The warranty period is 12 months from the date of sale. During the warranty period, the manufacturer carries out the repair or replace the tonometer free of charge upon presentation of the guarantee.

Warranty conditions.

The warranty is valid only if there is a warranty certificate correctly filled in, indicating the number of Tonometer Factory series, date of sale and stamp clear the seller.

The guarantee does not apply in the following cases:

- If the tonometer has traces of external manipulation or attempt to repair an unauthorized assistance for this;
- If changes are detected not authorized by the manufacturer tonometer
- If the tonometer has damage caused by foreign objects, substances or liquids;

The warranty does not apply to the power of the elements.

After the warranty period or discharge of the battery is the consumer himself who does the replacement. Storage warranty period is 12 months.

For the repair of a tonometer with damaged, this must be sent along with the instructions and explanatory note to the following address: **2460 NW 17th Lane, Suite 6, Pompano Beach, FL 33064.**