



**INSTRUCTIONS FOR USE**  
**Applanation tonometer**

# **AT 900<sup>®</sup> / AT 870**

27. Edition / 2022 – 09



Swiss made



## INSTRUCTIONS FOR USE

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## Preface

Thank you for choosing a Haag-Streit device. Provided you comply carefully with the regulations in these instructions for use, we can guarantee reliable and trouble-free use of our product.



### WARNING!

Applanation tonometry may only be conducted by appropriately trained and qualified medical personnel.



### WARNING!

Read the instruction manual carefully before commissioning this product. It contains important information regarding the safety of the user and patient.



### NOTE!

For USA only: Federal law restricts this device to sale by or on the order of a physician or licensed practitioner.

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## 1 Safety



### DANGER!

Failure to comply with these instructions may result in material damage or pose a danger to patients or users.



### WARNING!

These warnings must absolutely be complied with to guarantee safe operation of the product and to avoid any danger to users and to patients.



### NOTE!

Important information, please read carefully.

### 1.1 Comments on these instructions for use



### NOTE!

In these instructions for use the point is used as decimal separator.

### 1.2 Ambient conditions

Transport	Temperature	-40 °C	...	+70 °C
	Air pressure	500 hPa	...	1060 hPa
	Relative humidity	10 %	...	95 %
Storage	Temperature	-10 °C	...	+55 °C
	Air pressure	700 hPa	...	1060 hPa
	Relative humidity	10 %	...	95 %
Use	Temperature	+10 °C	...	+35 °C
	Air pressure	800 hPa	...	1060 hPa
	Relative humidity	30 %	...	90 %

### 1.3 Shipment and unpacking

- Before unpacking the device, check whether the packaging shows traces of improper handling or damage. If this is the case, notify the transport company that delivered the goods to you.
- Unpack the device together with a representative of the transport company. Make a report of any damaged parts. This report must be signed by you and by the representative of the transport company.
- Leave the device in the packaging for a few hours before unpacking it (condensation).
- Check the device for damage after it is unpacked.
- Return defective devices in the appropriate packaging.
- Store packaging material carefully so that it can be used for potential returns or when moving.



### NOTE!

Check the calibration of the device before first use according to the instructions in the 'Maintenance' chapter.

### 1.4 Installation warnings



### WARNING!

Do not modify this device without authorization of the manufacturer. Installation and repairs may only be performed by trained specialists.



### NOTE!

- When performing assembly on devices from other manufacturers, the connecting dimensions of the diverse tonometer models are to be taken into account.
- Check: Are the connection parts properly positioned (tonometer on the slit lamp, measuring prisms)?

## 1.5 Operation, environment



### WARNING!

- The examination is to be performed at the medical professional's discretion and consideration in cases of active infections and lesions of the eye. Certain conditions could falsify measured values and the procedure may interfere with the patient's condition.
- Use only original Haag-Streit Goldmann tonometer measuring prisms or the sterile disposable measuring prisms Tonosafe from Haag-Streit.
- Strong magnetic fields may falsify the measurement results.
- This device must not be operated near of high frequency surgical equipment and the radio frequency shielded room of a medical electrical system for magnetic resonance imaging, where the intensity of electromagnetic disturbances is high.
- Portable radio frequency communications equipment (including peripherals such as antenna cables and external antennas) should be used no closer than 30 cm (12 inches) to any part of the device, including cables specified by Haag-Streit. Otherwise, degradation of the performance of this device could result.



### NOTE!

- This device must only be operated by qualified personnel. The owner is responsible for their training.
- This device may only be used in accordance with the instructions in the 'Intended purpose / intended use' chapter.
- It is known that refractive surgery has an effect on GAT values, as the procedure changes the biomechanical properties of the cornea.
- The biomechanical properties of the cornea have an effect on the measurement readings.

## 1.6 Disinfection



### NOTE!

- The applanation tonometer can, but does not need to be disinfected. For more information, please refer to the 'Maintenance' chapter.

- The applied parts (headrest) should be disinfected prior to every examination. For more information, please refer to the instructions for use 'Headrest'.
- For cleaning and disinfection of the measuring prism see chapter below and the separate instructions for use on cleaning and disinfection of tonometer measuring prisms and contact lenses.

### 1.6.1 Cleaning and disinfection of the measuring prism



### DANGER!

The measuring prisms are made of PMMA. Please take note of the following restrictions:

- Do not disinfect with alcohol
- Do not clean with acetone
- Do not disinfect using UV radiation
- Do not sterilise using steam or ethylene oxide
- Do not expose to temperatures above 60°C



### WARNING!

Reusable measuring prisms are not shipped disinfected and must be cleaned and disinfected before their first use in accordance with the separate instruction manual on the cleaning and disinfection of tonometer measuring prisms and contact lenses.

- Preparation may only be conducted by qualified and trained personnel. Their training is the responsibility of the user.
- Appropriate professional assessment and caution are necessary.
- Only use clean, undamaged, and disinfected measuring prisms.
- Please observe the separate instruction manual on the cleaning and disinfection of tonometer measuring prisms and contact lenses.
- The operator will be liable in the event of non-observance of the cleaning and disinfecting process.

**NOTE!**

- Only those disinfectants tested by Haag-Streit for material compatibility may be used for disinfection.
- The current list is enclosed with every tonometer and measuring prism and can also be found on the Haag-Streit website ([www.haag-streit.com](http://www.haag-streit.com)).
- The separate instruction manual on the cleaning and disinfection of tonometer measuring prisms and contact lenses is to be consulted regarding the exact functioning, concentration, working times, and idle times.
- Improper preparation can result in the transmission of diseases to the patient and user as well as damage to the measuring prisms.
- Residue from cleaning agents and disinfectants may irritate and burn the patient's eye.
- As a rule, the measuring prisms may be prepared together but should not be prepared with any other products.
- In order to achieve efficient disinfection of tonometer measuring prisms, we recommend using one of the validated disinfection agents (see separate instruction manual on the cleaning and disinfection of tonometer measuring prisms and contact lenses).
- The validation report is available from Haag-Streit on request.
- A summary of the validation report can be found on the Haag-Streit website ([www.haag-streit.com](http://www.haag-streit.com)).
- The operator accepts all liability for the use of other disinfection agents.
- Single-use prisms must be replaced after every examination – see separate instructions for use.
- The above-mentioned instruction manual, the brief instructions Disinfection of tonometer measuring prisms and contact lenses, and additional information can always be found on our website [www.haag-streit.com](http://www.haag-streit.com).

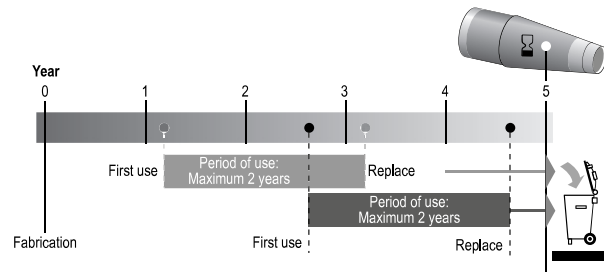
**1.6.2 Visual inspection of the measuring prisms for damages****DANGER!****Never use damaged measuring prisms.**

Prior to every use, the contact surface of the measuring prism must be inspected for contaminants and damage (scratches, cracks and sharp edges). **This must be performed with a slit lamp microscope at 10× to 16× magnification.**

**1.6.3 Period of use of reusable measuring prisms****WARNING!****How long may measuring prisms be used?**

Due to the large number of variables to be considered (type and concentration of the disinfectants used, number of patients, handling etc.) it is practically impossible to provide exact information on how often and/ or how long a measuring prism can be safely used.

The measuring prisms are stamped with an expiry date (YYYY-MM-DD). They must not be used beyond this date. Haag-Streit recommends a maximum period of use of two years before the expiry date. This period of use applies subject to normal conditions of use, i.e. in compliance with the instructions contained in these instructions for use. The period of use begins with the first application. The given time periods are not valid for damaged measuring prisms, they must be immediately replaced.



### 1.6.4 Tonosafe



#### NOTE!

Tonosafe was developed to avoid the necessary cleaning and disinfection of measuring prisms from applanation tonometers. Tonosafe is a disposable applanation and optical duplication prism for Goldmann and Perkins applanation tonometers, for single use. Additional details can be found in the separate instructions for use.

### 1.6.5 Monthly device checks

The tonometer must be checked on a monthly basis as described in the 'Maintenance' chapter. A check will be absolutely necessary if external force is applied (e.g., striking or dropping the device).



#### NOTE!

If a repair is necessary, please contact your Haag-Streit representative.

### 1.7 Warranty and product liability

- Haag-Streit products must be used only for the purposes and in the manner described in the documents distributed with the product.
- The product must be treated as described in the 'Safety' chapter. Improper handling can damage the product. This would void all guarantee claims.
- Continued use of a damaged product may lead to personal injury. In such a case, the manufacturer will not accept any liability.
- Haag-Streit does not grant any warranties, either expressed or implied, including implied warranties of merchantability or fitness for a particular use.
- Haag-Streit expressly disclaims liability for incidental or consequential damage resulting from the use of the product.
- This product is covered by a limited warranty granted by your seller.
- For USA only: This product is covered by a limited warranty, which may be reviewed at [www.haag-streit-usa.com](http://www.haag-streit-usa.com).

### 1.8 Reporting obligation



#### NOTE!

Any serious incident that has occurred in relation to the device must be reported to Haag-Streit and the competent authority of the Member State in your country.

### 1.9 Description of symbols



Follow instruction for use



Read the instructions for use attentively



General warning, read the accompanying documentation



European certificate of conformity



Date of manufacture



Manufacturer



Haag-Streit reference number



Serial number



Trademark of the manufacturer Haag-Streit AG



Notes on disposal, see the 'Disposal' chapter



Listed European Authorized Representative



Medical Device



Expiry date



LOT number

## 2 Intended purpose / intended use

The Goldmann Applanation Tonometer is a device used for measuring intraocular pressure using the Goldmann method.

### 2.1 Device description

The applanation tonometers AT870 and AT900 are mechanical devices to measure the intraocular pressure (IOP). The devices exert an adjustable force onto the surface of the patient's eye using an exchangeable measuring prism. The exact measurement of the applanation surface is performed at 10× magnification on the slit lamp.

#### 2.1.1 Intended users

Users are qualified medical professionals such as ophthalmologists, optometrists and researchers or other qualified specialists as permitted by local legislation.

### 2.2 Medical purpose

This device has the following medical purpose:

- Investigation of the physiological state of the oculus

#### 2.2.1 Indications

The use of this device is indicated for glaucoma.

#### 2.2.2 Part of the body

The applanation tonometer is designed for the examination of the human eye.

#### 2.2.3 Patient population

This device is intended for use on human patients with the physical ability to sit in front of a slit lamp with their head resting against the headrest in a steady position and the mental ability to follow instructions.

#### 2.2.3.1 Contraindications

The list of known contraindications includes, but is not limited to the following medical conditions:

- Active corneal infections
- Corneal epithelial defects
- Ocular chemical burn
- History of recurrent epithelial erosions

### 2.3 Principles of operation

The applanation tonometer applies the Imbert-Fick law to determine ocular pressure as a function of the corneal thickness:

A measuring prism is used to apply pressure to the cornea, creating an flattened surface. The force needed to flatten a surface of 3.06 mm diameter corresponds to the intraocular pressure, considering rigidity of the cornea and the capillary action of the tear film, assuming a standard corneal thickness of 520 µm.

#### 2.3.1 Operating environment

The applanation tonometer is intended to be used in professional health care facilities such as hospitals, physician's, optometrist's and optician's practices and can only be used in combination with a slit lamp microscope. For optimal use, the ambient light should be attenuated to improve image contrast. The procedure requires contact with the anaesthetised eye and must therefore be performed with a correctly disinfected measuring prism.

### 2.4 Clinical benefit

The clinical benefit of Goldmann Applanation Tonometry is the highly repeatable and reproducible measurement of the intraocular pressure. Intraocular pressure is an important parameter for diagnosis and monitoring of glaucoma, which may lead to blindness if left untreated.

The clinical benefits of the product outweigh the remaining residual risks to the patient.



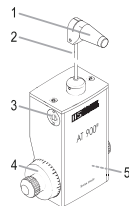
### 3 Introduction

The applanation tonometer functions according to the Goldmann method: measurement of the pressure required to maintain a uniform applanation of the surface of the cornea. The exact measurement of the applanation surface is performed at 10x magnification on the slit lamp.

The pressure is measured on the slit lamp with the patient seated and is part of a routine examination within the scope of conventional slit lamp microscopy.

#### 3.1 Overview

1. Measuring prisms (application part)
2. Sensor arm
3. Insert for control weight
4. Rotating knob with measuring drum
5. Type plate (underside)



### 4 Device assembly / installation



#### WARNING!

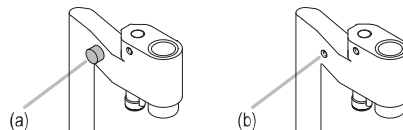
Installation, repairs and modifications may only be performed by trained specialists.

#### 4.1 AT 900 model R

A pivot is required for use of the Applanation Tonometer AT 900 model R on the BM 900 slit lamp. It is assembled as follows:

1. Unscrew the mounting screw found at the top, on the microscope's middle cylinder housing.
2. Leave the spring in the aperture.
3. Position and screw on tightly the pivot for the tonometer.
4. Place the tonometer bearer arm on the pivot's pin and swivel the tonometer to the right until it snaps into position. The tonometer will remain in this position even when not in use.

5. When using the BI 900, BM 900 and BM 900 V, the stop peg must be assembled (a), and when using the BC 900 or BD 900, it must be removed (b).

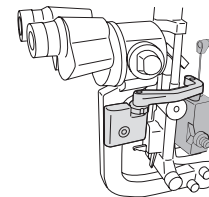


#### 4.2 AT 900 model T

The Applanation Tonometer is tucked into one of the holes on the horizontal guide plate over the slit lamp axis using the peg from the tonometer base.

#### 4.3 AT 900 model BQ

Connect the tonometer at the provided interface to the right side of the microscope arm.



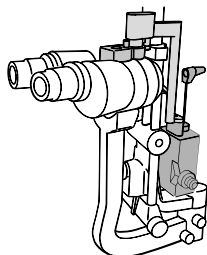
#### 4.4 Tonometer AT 870



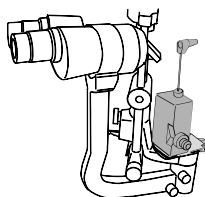
#### NOTE!

The instructions for devices from other manufacturers are to be observed.

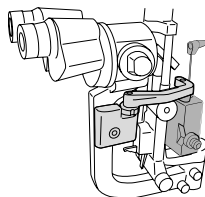
## 4.5 Which slit lamp with which tonometer



AT 900 model R



AT 900 model T



AT 900 model BQ

	Model R	Model T	Model BQ	AT 870
BD 900	•			
BM 900	•	•		
BI 900	•	•		
BP 900		•	•	
BQ 900		•	•	
BX 900		•	•	
Various				•

## 4.6 Description of models

- The Applanation Tonometer **AT 900 model R** can be left on the slit lamp permanently. It is fastened to the microscope on a mounting base and swivelled in front of the microscope for the examination. The observation of the applanated surface is conducted monocularly – only through the left eyepiece.
- The Applanation Tonometer **AT 900 model T** is set on the guide plate over the slit lamp axis, for tonometry purposes. The device can be moved between two positions on the guide plate for observation through the right or left eyepiece. The sensor arm with the measuring prism projects from the bottom side into the beam path of the microscope and the illumination.
- The Applanation Tonometer **AT 900 model BQ** has a working position and two resting positions. To set the correct angle of incidence of the illumination, the tonometer is swivelled and the illumination apparatus is positioned to the left of the tonometer bracket. The patient's left and right eyes can be easily examined in this position (no 60° position). The applanated surface is observed monocularly through the right eyepiece of the stereo microscope.
- The Applanation **Tonometer AT 870** is positioned over the slit lamp's (from other manufacturer) microscope. The feeler arm projects into the microscope and illumination beam path from above. The tonometer is ready for use with a single swivel movement of the feeler arm.



### NOTE!

The instructions for devices from other manufacturers are to be observed.

## 5 Commissioning



### WARNING!

It is imperative to read the 'Safety' chapter and to observe its precautions before operating the device.



### NOTE!

A smooth operation can only be guaranteed with the use of original Haag-Streit measuring prisms and Tonosafe.

## 6 Operation



### WARNING!

Reusable measuring prisms must be cleaned and disinfected after every examination.

### 6.1 Astigmatism

- If the cornea is spherical, measurements can be taken on any meridian, but it is most convenient to measure on the 0° meridian.
- However, the choice of meridian is significant when measuring eyes with corneal astigmatism greater than 3 dioptres, since the flattened area is not circular, but elliptical.
- It has been calculated that, in cases of greater corneal astigmatism, a surface of 7.354 mm<sup>2</sup> (ø 3.06 mm) is applanated if the measuring prism is at an angle of 43° (mark (A)) to the meridian of the greatest radius.

**Example:** If the corneal astigmatism measures

6.5 mm / 30° = 52.0 dpt / 30° and

8.5 mm / 120° = 40.0 dpt / 120°

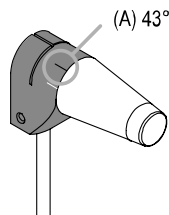
the 120° graduation mark on the prism is set on the mark (A) of the prism holder.

If, on the contrary, the measurements are

6.5 mm / 120° = 40.0 dpt / 120° and

8.5 mm / 30° = 52.0 dpt / 30°

then the 30° graduation mark is set on the mark (A), meaning that simply the axis position of the largest radius is placed on the mark (A).



### 6.2 How pressure is measured

The applanation tonometer functions according to the 'Goldmann method': measurement of the pressure required to maintain a uniform applanation of the surface of the cornea.

- The readings obtained are based on the assumption that a cornea with a 'normal' thickness is being measured; a different corneal thickness leads to changes in the measured IOP. A 'normal' corneal thickness is considered to fall within the range of 530 to 560 micrometre.

- If it is suspected that measuring results may be inaccurate, please conduct a functional verification in accordance with the 'Maintenance' chapter.

### 6.3 Preparing the patient



### WARNING!

Measurements without fluorescein can lead to false results.



### NOTE!

A smooth operation can only be guaranteed with the use of original Haag-Streit measuring prisms and Tonosafe.

1. Anaesthetise each eye
2. Apply Fluorescein into the eye to be examined
3. The correct eye height of the patient can be set via the chin rest.

### 6.4 Patient instructions

1. Press the head firmly against the chin and forehead rests.
2. The patient must look straight forward. If necessary, the small fixing light can be used to steady the eyes.
3. It is recommended that the patient be repeatedly reminded to keep his eyes open wide during the examination. It might be necessary for the examiner to keep the eye open by splaying the eyelids with thumb and index finger.
4. This must be done without applying any pressure to the eye.

### 6.5 Preparation of slit lamp and tonometer

#### For all Haag-Streit slit lamps and tonometers

1. Before the examination, the eyepieces must be adjusted correctly to the examiner.
2. Set the magnification to 10×.
3. Adjust the illumination to medium intensity.
4. Position the blue filter in the beam path of the slit lamp's illumination apparatus and open the slit diaphragm fully.
5. Insert the disinfected measuring prism into the (0° position) holder on the sensor arm. For Tonosafe, see the separate instructions for use.
6. Snap the sensor arm into place so that the axes of the measuring prism and of the microscope align.
7. Set the measuring drum to the first calibration line.

**AT 900 model R and AT 900 model BQ**

1. Swing the illumination apparatus to the left.
2. Release the tonometer from the dwell position to the right of the microscope, and swing it forward until it locks in the measuring position.
3. From the left, bring the illumination apparatus into contact with the tonometer bearer arm. This is the only illumination position in which both the patient's left and right eyes can be easily examined (no 60° position). This arrangement facilitates the splaying of the patient's eyelids, should this be necessary for measurement. The illumination of the applanated surface through the measuring prism is practically reflection-free.

**Observation:** with AT 900 model R in the left eyepiece  
with AT 900 model BQ in the right eyepiece

**AT 900 model T**

For an examination through the tonometer's left or right eyepiece, the angle between the illumination apparatus and the microscope should be approx. 60° so that the image is bright and reflection-free. Alternatively: lighting through the measuring prism at approx. 10°.

**AT 870**

1. Swing the sensor arm with the measuring prism into the beam path of the microscope and the illumination.
2. The angle between the illumination apparatus and the microscope should be approximately 60° so that the image appears bright and free of reflections. Alternatively: lighting through the measuring prism at approx. 10°.
3. Set the measuring drum to the first calibration line.
4. Set a mid-level illumination intensity.

**WARNING!**

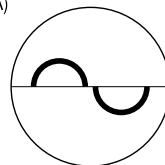
Measurements through observation with the wrong eyepiece adjustment can lead to false results.

**6.6 Measuring correctly****NOTE!**

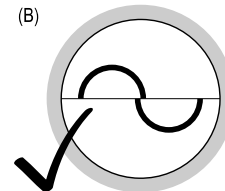
Make sure that the measuring arm of the tonometer can move freely and is not hindered by the patient's eyelashes, beard, etc.

1. Immediately before taking measurements, the patient should close his eyes briefly so that the cornea becomes sufficiently moistened with fluorescein-impregnated tear fluid.
2. By moving the slit lamp, the measuring prism comes into contact with the centre of the cornea over the pupillary area.
3. During contact, the cornea's limbus takes on a bluish glow. This glow can be best observed with the naked eye from the opposite side of the illumination apparatus.
4. When the limbus glows, stop moving the slit lamp immediately.
5. After contact is made, viewing is conducted through the microscope. The uniform pulsation of the two semi circular fluorescein bands, which could be of different sizes in drum setting 1 depending upon inter-ocular pressure, shows that the tonometer is in the right measuring position.
6. Any necessary corrections are done using the slit lamp control lever, until the flattened surface is observed in the form of two semicircles of similar size in the middle of the visual field (A).
7. Smaller changes in the depth of the slit lamp using the control lever do not affect the size of the semicircles.
8. The pressure on the eye is increased by turning the tonometer knob until the inner borders of both fluorescein bands just touch = correct setting (B).
9. When the eye pulsates, both semi circles cross over each other.
10. The width of the fluorescein band around the contact point of the measuring prism should be about 1/10 of the diameter of the applanation surface (0.3 mm).
11. Reading the scale value:
  - Reading the value
  - and multiplying by 10
  - yields the inter-ocular pressure in mm Hg

(A)



(B)



## 6.7 Sources of error

	Ocular images
Fluorescein band incorrect	1 - 2
Wrong distance to patient	3 - 4
Position too far to the right / left	5 - 8
Position too high / low	10 - 12
Incorrect pressure	14 - 16

### Fluorescein band too wide (1)

The measuring prism was not dried after cleaning or the eyelids came into contact with the measuring prism during measurement, or too much fluorescein has been used.

➔ *The slit lamp must be pulled back and the measuring prism dried with a lint-free towel (e.g., made of cellulose).*

### Fluorescein band too small (2)

The tear fluid has dried up during a prolonged measuring process.

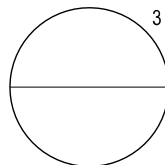
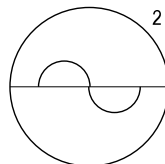
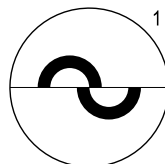
➔ *Allow the patient to close his eyes a few times and then repeat the measurement.*

## 6.7.1 Wrong distance to patient

### No semi circular image, only centre line is visible (3)

The measuring prism is not coming into contact with the cornea. If the patient draws his head back slightly, irregular pulsations will be caused because the measuring prism is touching the eye only intermittently. If the patient pulls back even further, the fluorescein rings will disappear completely.

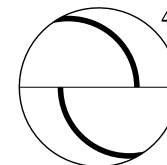
➔ *Instruct the patient to adopt the correct position.*



### Only parts of both oversize semicircles are visible (4)

If the slit lamp is pushed too far against the patient, or if the patient moves toward the slit lamp, the sensor arm will push against a spring stop. The applanation surface is too large.

➔ *The image does not change when the tonometer knob is turned. Pull the slit lamp back until the uniform pulsations of a correspondingly smaller surface show the correct measuring position and pressure changes immediately cause applanation surface changes.*

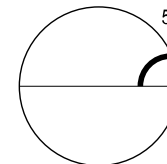


## 6.7.2 Position too far to the right / left

### Only part of the upper semicircle (5)

Measuring prism not centred on the eye, eye much too far to the right.

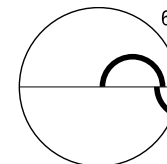
➔ *Using the control lever, move the slit lamp to the right.*



### Whole upper semicircle – part of the lower semicircle (6)

Measuring prism not centred on the eye, eye still too far to the right.

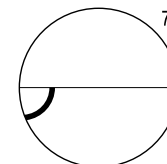
➔ *Using the control lever, move the slit lamp to the right.*



### Whole lower semicircle – part of the upper semicircle (7)

Measuring prism not centred on the eye, eye still too far to the left.

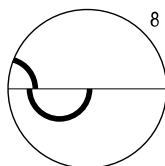
➔ *Using the control lever, move the slit lamp to the left.*



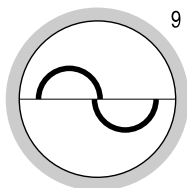
**Only part of the lower semicircle (8)**

Measuring prism not centred on the eye, eye much too far to the left.

➔ *Using the control lever, move the slit lamp to the left.*

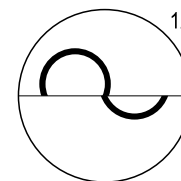
**Correct setting (9)**

Two semicircles appear exactly in the middle of the eyepiece.

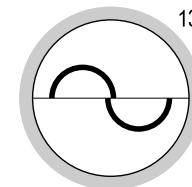
**Two incomplete circles, the larger one on top (12)**

Measuring prism not centred on the eye, eye still too high.

➔ *Using the control lever, move the slit lamp upwards.*

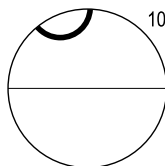
**Correct setting (13)**

Two semicircles appear exactly in the middle of the eyepiece.

**6.7.3 Position too high / low****Only part of a semicircle in the upper half (10)**

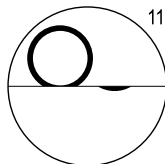
Measuring prism not centred on the eye, eye far too high.

➔ *Using the control lever, move the slit lamp upwards.*

**Nearly entire circle above, incomplete circle below (11)**

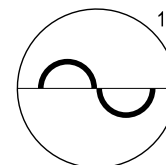
Measuring prism not centred on the eye, eye still too high.

➔ *Using the control lever, move the slit lamp upwards.*

**6.7.4 Incorrect pressure****The outside borders of the fluorescein bands are in contact with each other (14)**

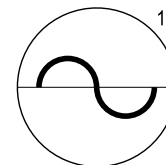
Not enough pressure.

➔ *Increase the pressure slightly by rotating the knob on the tonometer.*

**Fluorescein bands are superimposed to form a band (15)**

Pressure slightly too low.

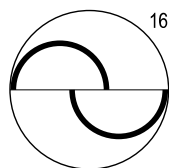
➔ *Increase the pressure slightly more by rotating the knob on the tonometer.*



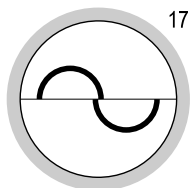
**Bands are no longer in contact (16)**

Pressure is too high.

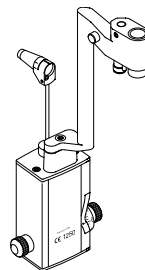
➔ Lower the pressure by rotating the tonometer knob in the opposite direction.

**Correct setting (17)**

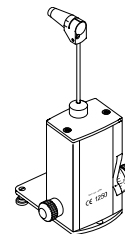
The inside borders of the fluorescein bands are contacting each other.

**7 Technical data****7.1 Applanation tonometer AT 900**

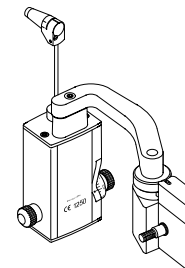
<b>Measuring force generated</b>	through leverage weight.	
<b>Installation</b>	AT 900 model R	Can be fitted on the peg on the microscope.
	AT 900 model T	Can be fitted on the guide plate on the swivelling peg for the microscope and illumination arm.
	AT 900 model BQ	Assembly on the microscope arm.
<b>Measurement range</b>	0 – 80 mm Hg	
<b>Measurement deviation</b>	The measurement deviation in the measuring prism is in the measuring range from 0 – 58.84 mN and amounts to a maximum of $\pm 1.5\%$ and to a minimum of $\pm 0.49$ mN of the nominal value.	
<b>Backlash width</b>	$\leq 0.49$ mN	
<b>Net weight</b>	AT 900 model R	0.73 kg (without accessories)
	AT 900 model T	0.49 kg (without accessories)
	AT 900 model BQ	0.78 kg (without accessories)



AT 900 model R



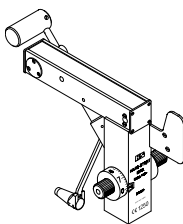
AT 900 model T



AT 900 model BQ

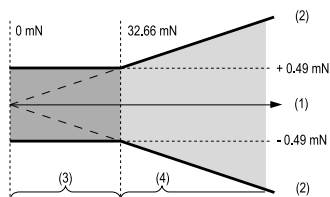
## 7.2 Applanation tonometer AT 870

<b>Measuring force generated</b>	Via spring force
<b>Installation</b>	On / over the microscope
<b>Measurement range</b>	0 – 80 mm Hg
<b>Measurement deviation</b>	See above model AT 900
<b>Backlash width</b>	≤0.49 mN
<b>Net weight</b>	0.850 kg (without accessories)



AT 870

1. Nominal value
2. Maximum limiting deviation
3. Limiting deviation of 0 to 32.66 mN: Maximum = 0.49 mN
4. Limiting deviation from 32.67 mN: Maximum = 1.5% of nominal value



## 8 Maintenance



### WARNING!

- Installation, repairs and modifications may only be performed by trained specialists.
- Do not repair or service the device while it is being used on the patient.

### 8.1 Repairs

To ensure a long service life, the device should be cleaned weekly as described.

We recommend having the device checked annually by an authorised service technician.

### 8.2 Cleaning and disinfection

Tonometer housing and sensor arm can, if required, be carefully wiped down with ready-for-use disposable 70% ethanol disinfectant wipes. Surface-friendly disinfectants (containing aldehyde or aldehyde-free) are also permitted, such as Kohrsolin FF.



### WARNING!

- The preparation instructions provided do not apply to tonometer measuring prisms.
- Tonometer measuring prisms must be prepared in accordance with a different manual.
- Comply with the stipulated exposure time.
- Observe the manufacturer's safety instructions.
- Too strong or aggressive disinfectants or cleaning liquids e.g. hydrogen peroxide will damage the finish and coating of the device.
- Do not use sprays.
- Do not use any towels that drip.
- Wring out any soaked towels before use when necessary.
- Ensure that no liquid penetrates the device.



### NOTE!

IP code: IPX0 (device is not protected against liquids)



### 8.3 Checking the Tonometer AT 900



#### NOTE!

This check must be carried out once a month. If the check yields erroneous results, please check the following points:

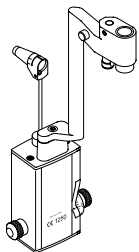
1. Is the measuring prism properly positioned?
2. Is the control weight correctly set?
3. Repeat the check.

Defective devices must be sent immediately to your Haag-Streit representative.

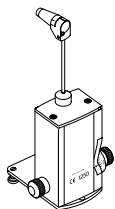


#### NOTE!

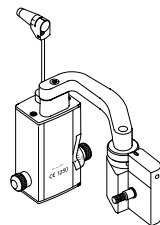
Haag-Streit offers a repair and service package. For further information, please contact your Haag-Streit representative directly.



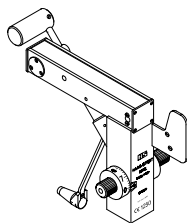
AT 900 model R



AT 900 model T



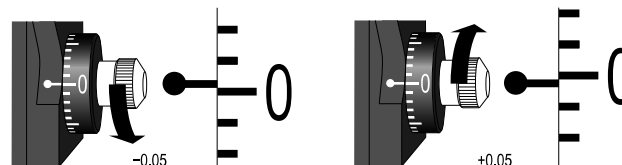
AT 900 model BQ



AT 870

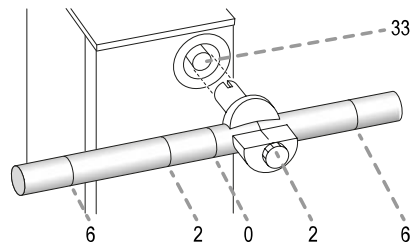
#### Check the drum position 0

- Check position  $-0.05$   
The zero line on the measuring drum is moved downwards, opposite the index, by a single marking width. The feeler arm must move by itself all the way to the stop-piece, in the direction of the examiner.
- Check position  $+0.05$   
The zero line on the measuring drum is moved upwards, opposite the index. The feeler arm must move all the way to the stop-piece, on the patient's side.

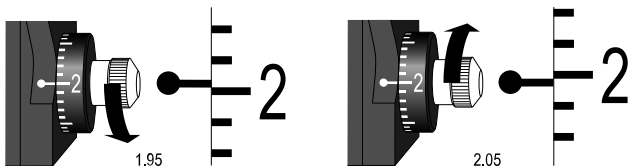


#### Check the drum position 2

- To conduct it, a control weight is used. The weight rod is engraved with five rings. The middle ring corresponds to a scale value of 0, the rings immediately to its left and right correspond to a value of 2, and both outside scale rings have a value of 6.
- One of the drum setting marks is set exactly to the index line on the holder. The weight is fitted on the feeler axis (33) so that the longer part points to the examiner.



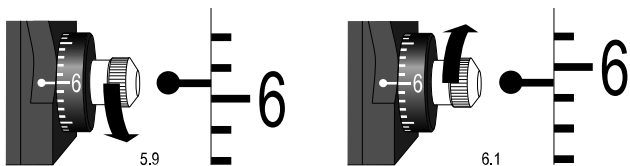
- Check position 1.95  
With a drum position of 1.95, the feeler arm must move from the free-movement area toward the limit stop in the direction of the examiner.
- Check position 2.05  
With a drum position of 2.05, the feeler arm must move from the free-movement area toward the limit stop in the direction of the patient.



### Check the drum position 6

Set the weight rod to 6 on the scale, the longer part points to the examiner.

- Check position 5.9  
The check point is at 5.9. Move the measuring drum's calibration mark 6 downwards, opposite the index, by a  $\frac{1}{2}$  interval. The feeler arm must move towards the examiner.
- Check position 6.1  
The check point is at 6.1. Move the measuring drum's calibration mark 6 upwards, opposite the index, by a  $\frac{1}{2}$  interval. The feeler arm must move towards the patient.



## 8.4 Checking the Tonometer AT 870



### NOTE!

This check must be carried out once a month. If the check yields erroneous results, please check the following points:

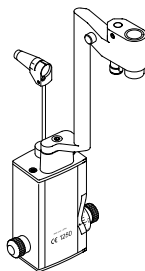
1. Is the measuring prism properly positioned?
2. Is the control weight correctly set?
3. Repeat the check.

Defective devices must be sent immediately to your Haag-Streit representative.

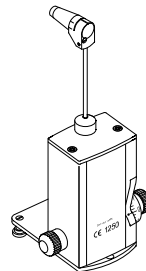


### NOTE!

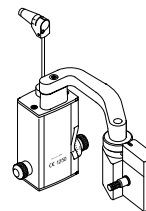
Haag-Streit offers a repair and service package. For further information, please contact your Haag-Streit representative directly.



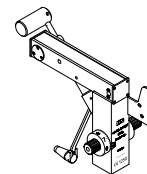
AT 900 model R



AT 900 model T



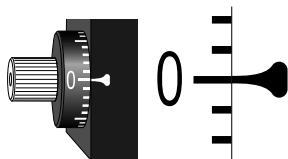
AT 900 model BQ



AT 870

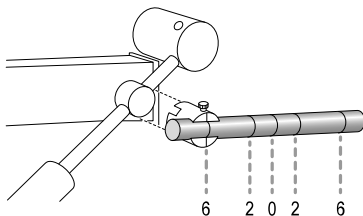
### Check the drum position 0

In working position, the feeler arm is swivelled and the measuring drum is set to 0. The arm carrying the measuring prism must swing freely between the limit stops on contact.

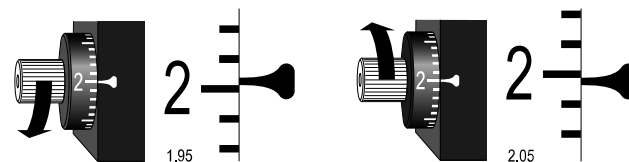


### Check the drum position 2

- The control weight is to be used for this inspection. The weight rod is engraved with five rings. The middle ring corresponds to a scale value of 0, the rings immediately to its left and right correspond to a value of 2, and both outside scale rings have a value of 6.
- A mark corresponding to the measuring drum setting 2 is set exactly to the index mark on the weight holder, whereupon the weight is fitted on the tonometer axis so that the longer part points in the direction of the patient. The feeler arm must move towards the patient.



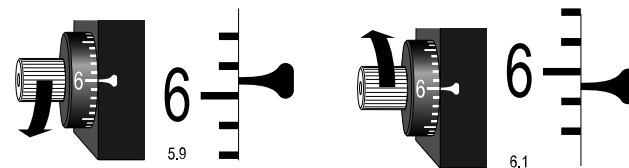
- Check position 1.95  
Move calibration mark 2 on the measuring drum downwards, opposite the fixed index, by a width of one marking. With light pressure to the feeler arm in the direction of free movement, the feeler arm must start to move independently towards the limit stop in the direction of the examiner.
- Check position 2.05  
Move calibration mark 2 on the measuring drum upwards, opposite the fixed index, by a width of one marking. The feeler arm must start to move into direction of the stop-piece on the patient's side.



### Check the drum position 6

Set the weight rod to 6 on the scale, the longer part points to the patient.

- Check position 5.9  
The check point is at 5.9. Move the measuring drum's calibration mark 6 downwards, opposite the index, by a  $\frac{1}{2}$  interval. The feeler arm should move towards the examiner.
- Check position 6.1  
The check point is at 6.1. Move the measuring drum's calibration mark 6 upwards, opposite the index, by a  $\frac{1}{2}$  interval. The feeler arm should move towards the patient.



## 9 Appendix



### WARNING!

- Do not modify this device without authorization of the manufacturer. Installation and repairs may only be performed by trained specialists.
- Contact your Haag-Streit representative for installation, repairs and modification work on the system. The contact details are available at [www.haag-streit.com](http://www.haag-streit.com).
- Only original Haag-Streit spare parts may be used.

### 9.1 Accessories / functionals parts / detachable parts / consumables

#### Components

	<b>REF</b>
Reusable tonometer measuring prism	7220316
Tonosafe disposable tonometer measuring prism	7220345
Control weight	3300346

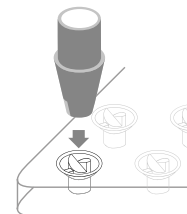
### 9.2 Original Haag-Streit measuring prism

The original Haag-Streit measuring prisms are made of PMMA and guarantee the best optical and mechanical quality. Reusable measuring prisms must be cleaned and disinfected after every examination. See chapter 'Cleaning and disinfection of the measuring prism' and the separate instructions for use.



### 9.3 Tonosafe disposable prisms

Tonosafe disposable prisms are a comfortable and effective solution to reduce the risk of cross-infection in patients. Tonosafe is available in sterile packages with 5 supports and 100 disposable prisms.



### 9.4 Legal regulations

- Haag-Streit maintains a quality management system in accordance with EN ISO 13485. The device was developed and designed in accordance with all the standards listed in chapter 'Observed standards'.
- This is a Class I device with measurement function in accordance with Appendix VIII of EU 2017/745 (Medical Device Regulation). By affixing the CE mark we confirm that our device complies with the applicable standards and directives.
- You can request a copy of the declaration of conformity for this device from Haag-Streit at any time.

### 9.5 Classification

EU 2017/745 (Medical Device Regulation)	Class Im (measuring function)
FDA	Class II

### 9.6 Disposal

For correct disposal, please contact your Haag-Streit representative. This will guarantee that no hazardous substances enter the environment and that valuable raw materials are recycled.

### 9.7 Observed standards

EN ISO 8612	EN ISO 17664
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Should you have any further questions, please contact your Haag-Streit representative at:  
[www.haag-streit.com/haag-streit-group/contact/haag-streit-distributors/distributors](http://www.haag-streit.com/haag-streit-group/contact/haag-streit-distributors/distributors)



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