

Pro Nano  
User Manual

## Pro Nano User Manual

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# 1 Introduction

Tobii Pro Nano welcomes you to the world of eye-tracking studies. Pro Nano is a small and portable eye tracker that you can use for studies on laptops, monitors up to 24" \* (16:9), mobile devices (using the mobile device stand), real-world interfaces, projections, simulators, and TV screens. It is designed for portability, versatility and ease of use.

Tobii Pro Nano is our smallest, most light-weight research grade eye tracker, featuring the latest technology advancements from Tobii Pro. The Pro Nano device measures 170 mm (6.69") long and weights 59 grams (2.1 oz.), and uses a sampling rate of 60 Hz. The design also serves as an introduction to extensive studies into human behavior for educational and research purposes.

Use Pro Nano on:

- Windows and Mac computers with an optimal screen size of up to 24" \* (16:9)
- Mobile devices, with our Mobile Device Stand
- Real-world setups like physical objects and social interactions, with the Tripod Stand
- Projections, simulators, and larger screens, with the Tripod Stand

\* For larger screens, the limiting parameter is the quality of the gaze accuracy at the upper corners of the screen when the user sits close to the screen.

## 1.1 Intended use

Pro Nano is primarily intended for fixation-based eye tracking studies on Windows and Mac laptops and Windows tablets. The Pro Nano system has been tested and proven capable of tracking a large proportion of the population, regardless of gender and ethnicity, with very high accuracy and precision on portable screens. Its discrete appearance, with fully embedded processing of eye-tracking data, enables flexible and unobtrusive data collection methods. The eye tracker's mounting plates enable easy attachment to various screens and the device is connected via a USB 2.0 port to your Windows or Mac computer.

Pro Nano is perfect for any researcher who wants to get started with or explore quality eye tracking as a research method for fixation-based eye tracking studies in:

- Psychology and cognition
- Package design in marketing research
- User interface design and development

Pro Nano is our smallest research-graded eye tracker designed for portable labs doing data collection in the field:

- Make your own portable research lab that fits in a backpack
- Collect data wherever your participants are, for instance at universities, hospitals, and public spaces

Pro Nano is well-suited for equipping universities with portable eye tracking solutions that enable students to test eye tracking and build knowledge how the technology can be used in different fields, answer research questions and enhance commercial endeavors.

## 1.2 Symbols used in this document

Three different symbols are used in this document:



The Information symbol means something is important or needs special attention.



The Tip symbol denotes additional information that can make a process or function easier.



The Warning symbol means there is a possible risk of harm if the warning is ignored.

## 1.3 What's in the box

- Pro Nano Eye Tracker
- USB 2 extension cable (1 m)
- Travel case
- Safety and Compliance and Installation Guide
- 2 cleaning wipes for cleaning the screen bezel before affixing the mounting plate
- 4 mounting plates with non-permanent adhesive for attaching the eye tracker to a screen bezel

## 1.4 How Pro Nano works

During eye tracking, Pro Nano uses infrared illuminators to generate reflection patterns on the corneas of the participant's eyes. These reflection patterns, together with other visual data about the participant, are collected by image sensors. Sophisticated image processing algorithms identify relevant features, including the eyes and the corneal reflection patterns. The Pro Nano is a single camera system that uses a combination of dark and bright pupil tracking. Complex mathematics is used to calculate the 3D position of each eyeball, and finally the gaze point; in other words, where the participant is looking.

## 1.5 Tobii Pro Eye Tracker Manager

Tobii Pro Eye Tracker Manager is free software available on [Tobii Pro Connect](#).

Pro Eye Tracker Manager helps you manage your Tobii Pro eye tracker. It lets you see which eye tracker firmware and software versions you are running and also facilitates updates (where applicable). It provides:

- Drivers and Firmware installation or updates
- Display setup

- Positioning guide
- User calibration
- Gaze visualization\*

\*Gaze visualization in Pro Eye Tracker Manager lets you quickly evaluate the quality of the eye tracking data. The Gaze visualization overlaps data only on the Pro Eye Tracker Manager screen while Pro Eye Tracker Manager is open.



References in product documentation to Tobii Pro Eye Tracker Manager refer to the latest version available on Tobii Pro's website.

## 2 Safety

### 2.1 Mounting warning



Tobii Pro eye trackers should be mounted according to Tobii Pro's instructions for approved mounts.

The mounting bracket is designed for adhesion to a wide variety of surfaces, such as monitors or laptop screens. It is also designed for clean removability. Failure to follow the recommended removal instructions can result in damage to both the monitor/laptop and the mounting bracket. Do not mount the eye tracker on monitors positioned above the head or face of a user, as it might fall.

### 2.2 Emergency warning



Tobii Pro eye trackers are designed to be used only for research purposes. Be aware that due to the low, but possible risk of failure or distraction, the eye tracker should not be relied upon or used in dangerous or critical situations.

### 2.3 Epilepsy warning



Some people with photosensitive epilepsy are susceptible to epileptic seizures or loss of consciousness when exposed to certain flashing lights or light patterns in everyday life. This may happen even if the person has no medical history of epilepsy or has never had any epileptic seizures.

A person with photosensitive epilepsy would also be likely to have problems with TV screens, some arcade games, and flickering fluorescent bulbs. Such people may have a seizure while watching certain images or patterns on a monitor, or even when exposed to the light sources of an eye tracker. It is estimated that about 3-5% of people with epilepsy have this type of photosensitive epilepsy. Many people with photosensitive epilepsy experience an "aura" or feel odd sensations before the seizure occurs. If you feel odd during use, move your eyes away from the eye tracker.

### 2.4 Infrared warning



When activated, the Tobii Pro eye tracker emits pulsed infrared (IR) light. Certain medical devices are susceptible to disturbance by IR light and/or radiation. Do not use the eye tracker in the vicinity of these kinds of susceptible medical devices, as their accuracy or proper functionality could be inhibited. Do not stare into the LED lights at a close distance (<15cm).



## 2.5 Magnetic field warning



This Tobii Pro eye tracker contains magnets. Magnetic fields may interfere with the function of cardiac pacemakers and implantable cardioverter defibrillators. As a general rule, maintain a minimum distance of 6 inches (15 centimeters) between any item with magnets and your heart device.

## 2.6 Child safety



A Tobii Pro eye tracker is an advanced computer system and electronic device. As such, it is composed of numerous separate, assembled parts. In the hands of a child, some of these parts have the possibility of being separated from the device, possibly resulting in a choking hazard or other danger to the child.

Young children should not have access to, nor use of the device or its accessories without parental or guardian supervision.

## 2.7 Electricity



Do not open the casing of the Tobii Pro eye tracker, this could expose you to potentially hazardous electrical voltage. The device contains no user-serviceable parts. Non-compliance will result in loss of warranty! Contact Tobii Pro Support if your eye tracker is not working properly.

## 2.8 Accessories



Only use accessories provided by or approved by Tobii Pro AB.

## 2.9 Third party



Any use of a Tobii Pro eye tracker outside the intended use and together with any third-party software or hardware that changes the intended use is a risk, and Tobii Pro AB can not take any responsibility in these situations.

# 3 Software and System Requirements

Pro Nano is connected to a computer via a standard USB 2.0 interface. All eye tracking processing is done in the internal Eye Chip.

## 3.1 System requirements

Operating system	Windows 10 Professional or Enterprise editions macOS High Sierra and Mojave
CPU	1 GHz, 2 cores
RAM	2 GB RAM memory <b>Note:</b> Software for eye-tracking research might require higher RAM
Connectors	USB 2.0 Type A

## 3.2 Pro Nano compatibility – Windows

Platform support	Windows 10, Professional or Enterprise editions
Tobii Pro Software support	Tobii Pro Lab version 1.101 or newer Tobii Pro Eye Tracker Manager version 2.0 or newer
SDK support	Tobii Pro SDK version 1.7 or newer

## 3.3 Pro Nano compatibility – macOS

Platform support	macOS 10.13 High Sierra; macOS 10.14 Mojave or newer
Tobii Pro Software support	Tobii Pro Eye Tracker Manager version 2.0 or newer
SDK support	Tobii Pro SDK version 1.7 or newer

## 4 Additional Tobii Pro products & accessories

### 4.1 Additional software options

Pro Lab <a href="https://tobii.com/product-listing/tobii-pro-lab/">tobii.com/product-listing/tobii-pro-lab/</a>	Pro Lab is a comprehensive research software platform for eye tracking designed to meet the highest demands on different research scenarios with exact timing accuracy. This software offers an efficient workflow, making it easy to design experiments, record data, analyze and visualize eye tracking data, and to sync this data with other biometric data streams.
Pro SDK <a href="https://tobii.com/product-listing/tobii-pro-sdk/">tobii.com/product-listing/tobii-pro-sdk/</a>	Pro SDK offers a broad set of tools that makes it simple to develop a variety of niche applications or scripts across multiple platforms, using a wide range of programming languages. This SDK gives the researcher access to the full set of relevant gaze data streams, such as 3D eye coordinates, raw data, pupil data, etc.
Third-party software	This term refers to any application built on Pro SDK.

### 4.2 Compatible accessories

- Mobile Device Stand
- Additional Mounting Brackets
- Tobii Pro Tripod Stand

Learn more about Tobii Pro Nano accessories available for purchase on [tobii.com](https://tobii.com).

# 5 Set Up Your Tobii Pro Eye Tracker

At the end of this setup, you will have a verified installation that is ready for use. Begin setting up your Pro Nano by unpacking the eye tracker.

Read more about setting up and installing your eye tracker in the [Tobii Pro Learning Center](#).

## 5.1 Download and install Tobii Pro Eye Tracker Manager

The first step is to get the free application, Tobii Pro Eye Tracker Manager on your computer. Setting up your eye tracker involves installing the necessary drivers and software on your computer and Pro Eye Tracker Manager makes this much easier. Read more in [Tobii Pro Eye Tracker Manager](#).



Your eye tracker does *not* need to be connected to the computer to install Eye Tracker Manager.

1. Before starting, double-check the Pro Nano's [System requirements](#).
2. Download Pro Eye Tracker Manager from [tobiipro.com](http://tobiipro.com).
3. Install Pro Eye Tracker Manager.
4. Proceed to the next step.

For more information about setting up Pro Nano and using Pro Eye Tracker Manager, visit the [Tobii Pro Learning Center](#).



This document assumes the use of Tobii Pro Eye Tracker Manager 2.0 or later.

## 5.2 Install the eye tracker in Tobii Pro Eye Tracker Manager

Now we need to make sure your computer can talk to your eye tracker. This is necessary for downloading the applicable drivers and updates.

1. Open Pro Eye Tracker Manager if it is not already running.
2. Connect the Pro Nano's USB cable to a USB port on your computer. Don't mount (affix to the computer) the eye tracker just yet, merely plug in the USB and lay the eye tracker beside the computer until you know everything's working.
3. If your Pro Nano is connected to the USB port but doesn't appear in the list of connected eye trackers, click the plus (+) symbol in the upper right corner to install (or re-install in some cases) the required drivers. Sometimes restarting Pro Eye Tracker Manager is necessary.
4. Select Tobii Pro Nano and click the Install button.

5. Follow the prompts in Pro Eye Tracker Manager to finish installation.
6. Proceed to the next step.

### 5.3 Mount the eye tracker on a laptop or monitor

To ensure quality in eye tracking data, your eye tracker hardware package includes several mounting plates that can be affixed to a laptop or monitor. You can easily snap the eye tracker on and off the screen bezel using the magnetic mounting plate. The mounting plate sticks to the frame with a special adhesive that doesn't damage the underlying surface when the mounting plate is removed. For more information, read [Detach the eye tracker](#).

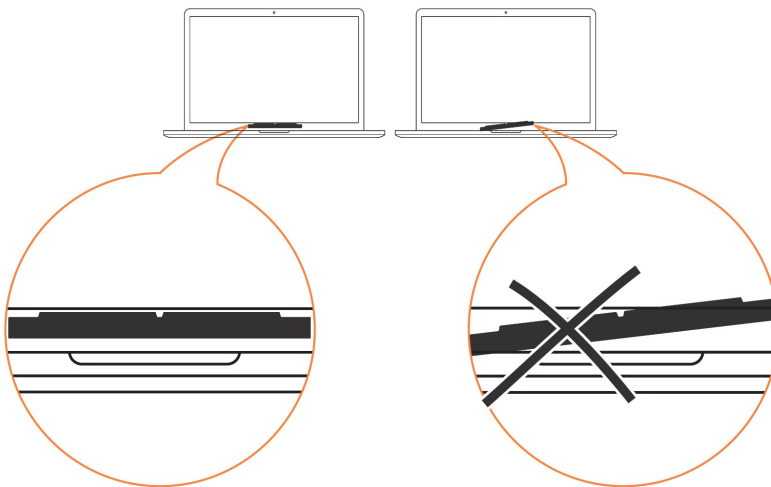
#### What to do:

1. Check that your eye tracker is detected and displayed as a "card" in Pro Eye Tracker Manager. Expand your eye tracker's "card" in Pro Eye Tracker Manager to see that the serial number of your eye tracker matches the number displayed.
2. You can leave your eye tracker USB connected and beside your computer or you can disconnect it while attaching the mounting hardware.
3. Find the center of the screen and clean the bezel.



**Important!** If you plan to attach the eye tracker to a laptop, make sure the laptop can close with the magnetic mounting plate attached. Some laptops have very little space when closed and this could damage the screen.

4. Peel the adhesive tape off the mounting plate and mount it on the bezel. Press the bracket against the bezel for 30 seconds and leave it there for one hour before attaching the eye tracker.



*Figure 1. Align the mounting bracket properly. The magnet holds the eye tracker firmly in place when the slots are lined up correctly.*

5. Attach the eye tracker and make sure that it aligns properly with the mounting plate. The magnet holds the eye tracker firmly in place when the slots are lined up properly.

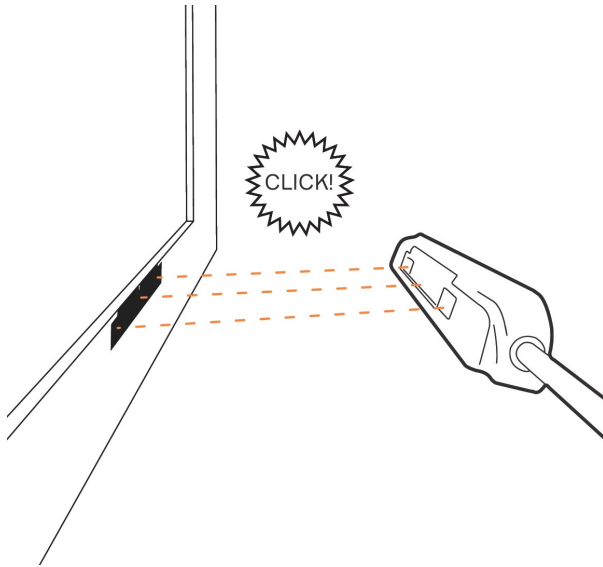


Figure 2. Place the mounting bracket on the bezel so that the Pro Nano is as close to the bottom of the screen as possible without covering the screen.

6. If Pro Nano is not connected, plug in the USB cable to the correct USB port in your computer.
7. Proceed to the next step.

## 5.4 Display setup in Tobii Pro Eye Tracker Manager

Now your computer needs to understand where the eye tracker is in relation to the screen.

1. Open Pro Eye Tracker Manager if it's not already opened and select your eye tracker.
2. On the Overview tab, locate **Display Setup** and click the ellipsis button to the right. On the drop-down menu, click New.
3. Select the display setup you're using and click the Next button.
4. Follow the instructions in each configuration step.
5. To confirm that the eye tracker can detect your eyes, enable the Position Guide at the bottom left of Pro Eye Tracker Manager. Once activated, you should be able to see two circles in a face contour.
6. In the next step, you will test your setup by performing a calibration. See [Calibration](#).



You can always return to Pro Eye Tracker Manager and use it when you change computers or screens or when you wish to redo a setup.

## 5.5 Calibration

When you are done configuring your eye tracker, you should run a calibration to test if the eye tracker is mapping the gaze points correctly to your display.

To test your eye tracking setup:

1. Make sure the eye tracker is attached to the monitor and connected to your computer. Open Pro Eye Tracker Manager. For more information, read [Tobii Pro Eye Tracker Manager](#).
2. By now, you should have also tested your setup as described in [Display setup in Tobii Pro Eye Tracker Manager](#).
3. Click the **Calibrate** button in Pro Eye Tracker Manager and follow the on-screen instructions.
4. Evaluate your calibration results. Large systematic errors i.e. a large distance between the average gaze point and the target gaze point may be indicative of a configuration error. No calibration feedback data on the targets located on the top of the screen may indicate that there is a mismatch between the screen size and eye tracker configuration. Click the Recalibrate button to improve a calibration. Click the **Use Calibration** button when you are satisfied with the your calibration.

### 5.5.1 What calibration does

The human eye shows a natural individual variation in its shape and geometry. For example, the exact location of the fovea, the area responsible for the part of the visual field that we perceive in focus and full color, varies from individual to individual. Tobii Pro Eye Trackers use an individual calibration procedure to optimize their gaze estimation algorithms (i.e. the 3D eye model) and account for this variation. The end result of this optimization is a fully-customized and more accurate gaze point calculation.

You can do basic calibration in Pro Eye Tracker Manager. There is more functionality, including calibration validation, in Tobii Pro Lab.

You can find more information in the Tobii Pro Learning Center about [calibration](#) and [performing a calibration and validation in Pro Lab](#).

### 5.5.2 Additional information for experienced users



A participant can be calibrated with Pro Nano even when only one eye was successfully calibrated. That calibration gets copied to the “failed” eye as well, and this might cause poor data for that eye.



Pro Nano produces only one vector for the calibration results, thereby providing information on the average estimated accuracy, but not on the estimated precision.



Use the Left and Right eyes results in Pro Eye Tracker Manager and Pro Lab to determine whether both eyes were calibrated successfully. You can also choose to analyze the data only for the eye that successfully calibrated.

## 5.6 Detach the eye tracker

To temporarily remove the eye tracker, pull it away from the magnetic mounting plate and leave the magnetic plate in place.

To permanently remove the magnetic mounting plate, you must remove the non-permanent but strong adhesive that fastens your eye tracker mounting plate to the screen bezel. Since it is fairly strong, you may not be able to take it away with only your fingers. If you want to remove it, we recommend using something very thin such as dental floss or a thin thread, a guitar pick, or a credit card. Use this to slide between the mounting plate and the computer bezel (or whatever it is attached to). As you slide it behind the mounting plate, gently bend the mounting plate backwards so that it detaches.



# 6 Display Setups

## 6.1 Standard setup

The standard setup for using the Tobii Pro Nano is with a screen up to 24" \*. The eye tracker is attached below the screen whether it is a laptop screen or separate monitor.

\* For larger screens, the limiting parameter is the quality of the gaze accuracy at the upper corners of the screen when the user sits close to the screen.

## 6.2 Tips for setting up the eye tracker display

If the screen bezel is thinner than the width of the eye tracker, affix the mounting plate as low as possible on the screen frame, or directly on the screen.

- Don't use this setup if you intend to put stimuli in the lower part of the screen, as the eye tracker might cover them.
- We recommend that you remove the mounting plate before closing the lid of the laptop.
- Use Pro Eye Tracker Manager's "Display Setup – Advanced" to select a negative value for the height distance between the top of the eye tracker and the bottom of the display screen. Alternatively, use the tripod accessory and mount the eye tracker away from the screen.

## 6.3 Set up with a tripod

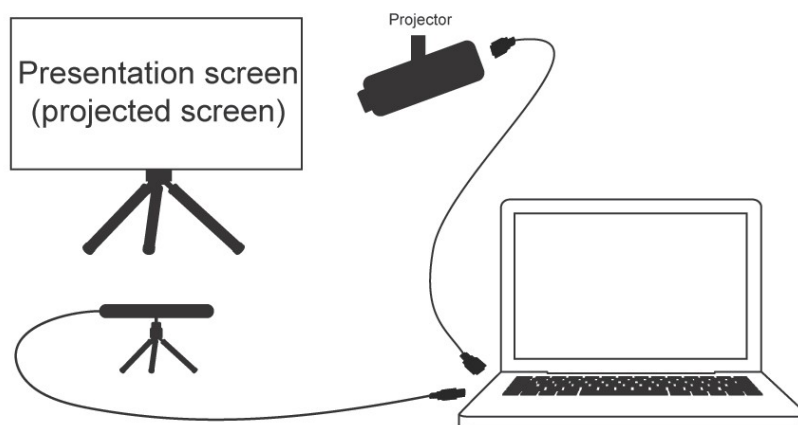


Figure 3. Set up with a tripod

If you want to use a wider screen, the hardware is set up in a slightly different manner:

1. Select a suitable location and set up the screen.
2. Set up the projector and connect it to the laptop.
3. Mount the eye tracker on a separate tripod and connect it to the laptop.
4. Use Pro Eye Tracker Manager's Advanced Setup to ensure that the eye tracker can detect the participant's eyes. Select **New** in the drop-down **Display Setup** menu and follow the steps.
5. Give your screen configuration a name so that you can reuse the settings later. Type it in the Display Setup Name text box, then click the **Save** button. Your configuration is now available and selected in the Display setup drop-down menu.
6. Test the screen configuration by performing a calibration. If you are tracking a physical plane instead of a screen, the calibration must be done in Pro Lab.

For more detailed instructions, read the Tobii Pro Learn article [Using Pro Eye Tracker Manager to configure the eye tracker](#).



You must measure and specify all the parameters as accurately as possible to maintain good eye tracking data quality.

# 7 Start Experimenting

Now that your eye tracker is up and running, you can move to the eye tracking software you will use. Tobii Pro recommends [Tobii Pro Lab](#) and [Additional software options](#).



You can always return to [Tobii Pro Eye Tracker Manager](#) and use it when you change computers or screens or want to redo a setup.

## 7.1 Start eye tracking

To see where the participant's focus is, open Pro Eye Tracker Manager and activate Gaze Tracking by toggling the **Gaze Visualization** switch on the **Overview** tab. A hazy blob appears on the screen, indicating where attention is focused. Use this functionality to verify that your eye tracker is running, that the display is correctly set up, and that your eye tracker is calibrated.

## 7.2 Tobii Pro Lab

Tobii Pro Lab provides a comprehensive platform for the recording and analysis of eye gaze data, which helps in the interpretation of human behavior, consumer responses, and psychology. Combining simple preparation for testing procedures and advanced tools for Visualization and analysis, eye-tracking data is easily processed for useful comparison, interpretation, and presentation. A broad range of studies are supported, from usability testing and market research, to psychology and oculomotor physiological experiments. Pro Lab's intuitive workflow, along with its advanced analysis tools, enables large and small studies in a timely and cost-efficient way without the need for extensive training.

In addition to offering powerful analysis tools, Pro Lab is also designed to work with other software commonly used for recording and analyzing data. This is done by synchronizing with recording software using TTL, as well as by enabling data exports in standardized formats, for example for Microsoft Excel, Matlab, and SPSS.

## 7.3 Keep your eye tracker software and display setup updated

### Updates

From time to time, Tobii Pro releases updates for an eye tracker's applicable driver and firmware in order to improve performance and/or introduce new functionalities. Please check the Tobii Pro website regularly for news and information about updates about your eye tracker. We recommend that you activate updates and notifications in Pro Eye Tracker Manager.

How to activate notifications and updates in Pro Eye Tracker Manager:

1. Click to expand the drop-down list at the top of Pro Eye Tracker Manager.
2. Toggle the switches for notifications. Orange means they are activated.
3. If a software update is available, the available update has a clickable orange link.
4. Select an interface language. The default is English.

## Display setup updates

Use Pro Eye Tracker Manager whenever you change computers or display setups.



All references to Pro Eye Tracker Manager assume that you are using the latest version of this free software.

# 8 Product Care

## 8.1 Transportation and storage

Use the provided case when traveling with the eye tracker. For shipping and storage, use the original packing.

For transportation and storage, the recommended range for temperature and humidity for the device is as follows:

- **Temperature:** -40°C to 70°C (-40°F to 158°F)
- **Humidity:** 20% to 95% (no condensation on the device)



Tobii Pro eye trackers are not waterproof or water resistant. The eye tracker should not be kept in excessively humid, damp or wet conditions. Do not submerge the eye tracker in water or in any other liquid. Be careful not to spill liquids on the device.

## 8.2 Cleaning

- Before cleaning the Pro Nano eye tracker, unplug its USB cable.
- Use a soft, slightly damp, lint-free cloth and clean the eye tracker's front gently.
- Avoid getting moisture in openings on the device.
- Don't use window cleaners, household cleaners, aerosol sprays, solvents, alcohol, ammonia, or abrasives.



Scratches on the front surface of the eye tracker may impair its performance.

## 8.3 Disposal of the eye tracker

Do not dispose of your Tobii Pro eye tracker in general household or office garbage receptacles. Follow your local regulations for the proper disposal of electrical and electronic equipment.

## 8.4 Limitation of liability

Except where prohibited by law, Tobii Pro AB is not liable for any loss or damage arising from the use or misuse of a Tobii Pro eye tracker or the mounting plate, whether direct, indirect, special, incidental or consequential, regardless of the legal theory asserted, including warranty, contract, negligence, or strict liability.

# 9 Technical Specifications

## 9.1 Eye tracking specifications

The characteristics of the gaze data from an eye tracker can be described in terms of accuracy and precision. Accuracy describes the angular average distance from the actual gaze point to the one measured by the eye tracker. Gaze precision describes the spatial variation between successive samples collected when the subject fixates at a specific point on a stimuli.

Eye tracking technique	Video-based pupil- and corneal reflection eye tracking with dark and bright pupil illumination modes. One camera capture images of both eyes for accurate measurement of eye gaze and eye position in 3D space, as well as pupil diameter.
Sampling frequency	60 Hz
Precision*	0.10° RMS in optimal conditions**
Accuracy*	0.3° in optimal conditions
Binocular eye tracking	Yes
Total system latency	1 frame (17 ms)
Blink recovery time	1 frame (immediate)
Gaze recovery time	250 ms
Data sample output***	Timestamp Gaze origin Gaze point Pupil diameter
Eye image data stream	Not available
TTL input stream	Not available
Tracker and client time synchronization	Integrated between the eye tracker time domain and the client computer time domain.

\*Tobii Pro uses an extensive test method to measure and report performance and quality of data. Please download the [Tobii Pro Nano Eye Tracker Data Quality Test Report](#) for more detailed information.

\*\* Using built-in filtering

\*\*\* For more information about output data and the supplementary data stream, read the [Tobii Pro SDK documentation](#).

## 9.2 Setup

Head movement tolerance	Good. One-camera system gives an accurate calculation of the data and a good level of precision. More sensitive to head movement than dual camera systems.
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Freedom of head movement (at 65cm distance)*	Width x height: 35 cm x 30 cm (13.78" x 11.81") at 65 cm (25.59") (at least one eye tracked)
Freedom of head movement* (at 80 cm distance)	Width x height: 45 cm x 45 cm (17.7" x 17.7") (Circular shape with at least one eye tracked)
Operating distance (mounted on screen)	45-85 cm (18"-33") from the eye tracker
Tracker setup options	Tracker mounted on tripod allows for even larger screens or physical objects to be tracked
Optimal screen size	Up to 24" **

\* Describes the region in space where the participant can move their head and still have at least one eye within the eye tracker's field of view (trackbox) at the specific distance.

\*\* For larger screens, the limiting parameter is the quality of the gaze accuracy at the upper corners of the screen when the user sits close to the screen.

### 9.3 Software compatibility

Software and framework compatibility	Tobii Pro Lab Tobii Pro Eye Tracker Manager Tobii Pro SDK Any application built on the Tobii Pro SDK
Operating system	Microsoft Windows, Apple Mac

### 9.4 Hardware versions

Single product version	60 Hz
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### 9.5 Pro Nano Eye Tracker specifications

Dimensions (L x H x W) in cm/inches	17 x 1.8 x 1.3 (6.69" x 0.71" x 0.51")
Weight	59 g (2.1 oz)
Connectors	USB 2.0 Type A
Data processing	Tobii EyeChip™ with fully embedded data processing.
Eye tracker cameras	1
Illuminators	Dark pupil Illumination Modules, Bright pupil Illumination Modules
Power consumption	Typical power consumption: <1.5 W Max. rated power consumption: 6 W
Power options	Directly via USB 2.0 Type A

# Appendix A Compliance

The certification and compliance statements in this section apply to the Tobii Pro Nano eye tracker.

Pro Nano has been tested and found safe for indoor use, and is intended for office and industrial environments, and for laboratories, classrooms and homes. The product complies with regulations related to electromagnetic safety and eye safety. Pro Nano adheres to the regulations related to sustainability, such as restrictions for hazardous substances and waste.

Pro Nano has market compliance in the following countries or regions:

- European Economic Area
- USA
- Canada
- Japan
- China
- Australia
- New Zealand
- South Korea

## Safety

Safety standards:	<ul style="list-style-type: none"><li>• IEC 60950-1:2005 +A1 +A2, Safety of Information Technology Equipment</li><li>• EN 62368-1:2014 +A11:2017, Audio/video, information and communication technology equipment - Part 1: Safety requirements</li><li>• IEC/EN 62471:2008, Photo Biological Safety of Lamps and Lamp Systems</li></ul>
Certification and declaration of conformance:	CE, RCM

## Sustainability

Directives:	<ul style="list-style-type: none"><li>• 2011/65/EU(RoHS)-Restriction of Hazardous Substances Directive</li><li>• 2012/19/EU(WEEE)-Waste Electrical and Electronic Equipment Directive</li></ul>
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## EMC

EMC standards:	<ul style="list-style-type: none"><li>• EN 55032:2015, Electromagnetic compatibility of multimedia equipment. Emission requirements</li><li>• EN 55024:2010+A1:2015, Information technology equipment, Immunity characteristics, Limits and methods of measurement</li><li>• EMC Emission: EN 61000-6-3:2007, Generic Emission standard for residential, commercial and light industry environments</li><li>• EMC Immunity: EN 61000-6-1:2007, Generic Emission standard for residential, commercial and light industry environments</li><li>• FCC part 15, Class B</li><li>• ICES-003, Class B</li><li>• AS/NZS CISPR32:2015, Electromagnetic compatibility of multimedia equipment - Emission requirements</li><li>• KC standard (KC-KN-32/35)</li></ul>
Certification and declaration of conformance:	CE, FCC part 15, Class B, ICES-003 Issue 5, KC standard (KC-KN-32/35), RCM
Directives:	2014/30/EU (EMC) - Electromagnetic Compatibility Directive

# Appendix B Support, Training, and Warranty

## B1 Customer Support

If you need help, please contact [Customer Support](#) at Tobii Pro. In order to receive assistance as quickly as possible, make sure you have access to your Tobii Pro device and, if possible, an Internet connection. You should also be able to supply the serial number of the device, which you will find on a sticker on the back or bottom of the device.

### B1.1 Get help online

Many questions can be answered by visiting Tobii Pro Connect. It contains the latest information about contacting Support, helpful articles and FAQs, links to downloads, and much more. Log in or register to see information about your account and to reach Customer Support on [Tobii Pro Connect](#).

## B2 Training and Education Services

If you are new to eye tracking, or want to extend your knowledge about eye tracking research, sign up for one of our learning programs and events on our website at [Training and Education Services](#).

## B3 Warranty information

Read more online about [Tobii Pro Care and Tobii Pro's eye tracker warranty](#).

# Appendix C      Limitations and considerations

## C1      Intended use



Tobii Pro eye trackers are intended to be used in research activities about human behavior including eye movements, in a dry and dust free indoor environment. The product should only be used as described in this User's Manual. Please read the User Manual and other supplied documentation thoroughly before using the product.

## C2      Light conditions



Tobii Pro recommends that eye tracking studies be performed in a controlled environment. Sunlight should be avoided since it contains high levels of infrared light which will interfere with the eye tracker system. Sunlight affects eye tracking performance severely and longer exposure can overheat the eye tracker. This eye tracker is not designed for exposure to (direct) sunlight. Eye tracking generally does not work in strong direct sunlight.

Shielding the eye tracker adequately from the sun may prevent sunlight from interfering with eye tracking.

## C3      Eyelashes



Long eyelashes can be obstructive when the participant's eyes are less open, especially if the participant is wearing mascara. In rare cases, eyelashes may completely block the view of the participant's pupils, making eye tracking impossible.

## C4      Droopy eyelids



Droopy eyelids or otherwise obstructive eyelids can block the view of the participant's pupils. In rare cases, such eyelids may completely block the view of the participant's pupils, making eye tracking impossible.

# Appendix D Glossary

<b>Accuracy</b>	The angular average distance from the actual gaze point to the one measured by the eye tracker. For more details on how accuracy is calculated, please read the Data Quality Test Report for this eye tracker on <a href="http://tobii.com">tobii.com</a> .
<b>Binocular calibration</b>	The eye tracker collects data from both eyes the same time and processes the data for each eye independently. The calibration is valid when it succeeds in collecting and processing data from both eyes.
<b>Binocular eye tracking</b>	Tracks and reports data for both left and right eye.
<b>Blink recovery time (time to tracking recovery for blinks)</b>	When a participant blinks, the eye tracker loses the ability to track eye gaze because the eye is covered by the eyelid. If the pupil is occluded for only a short period (a few hundred milliseconds), the system will regain tracking immediately when the pupil becomes visible again, but only if the subject has maintained approximately the same head position during the blink. Data during blinks are only lost when the pupil is occluded, i.e. during the eye lid movement itself or when the eye is closed.
<b>Bright pupil tracking</b>	The process of capturing and processing eye images, with a set of illuminators that are placed close to the optical axis of the camera. This causes the pupil to appear lit up in the image (this is the same phenomenon that causes red eyes in photos). The eye tracking algorithms identify the pupil by searching for a bright elliptical form in the image.
<b>Dark pupil tracking</b>	The process of capturing and processing eye images, with a set of illuminators that are located further from the optical axis of the camera. This causes the pupil to appear darker than the rest of the eye in the image. The eye tracking algorithms identify the pupil by searching for a dark elliptical form in the eye image.
<b>Data sample output</b>	Type of data provided by the eye tracker
<b>Eye image data stream frequency</b>	The number of eye images per second outputted in the eye image data stream, expressed in Hz units. These images can be used to help to troubleshoot tracking issues.
<b>Freedom of head movement</b>	Describes the region in space where the participant may move his/her head and still have at least one eye within the eye tracker's field of view (trackbox).
<b>Gaze recovery time</b>	An eye tracker working in a natural user environment may occasionally lose track of the subject's eyes, e.g., when the subject completely turns away from the tracker. If a period of a few hundred millisecond elapses during which the eye tracker is unable to detect the eyes near where they were last detected, the eye tracker will start searching for the eyes within the entire head movement box. The stated measurement is the

typical time to tracking recovery once the eyes return to the field of view of the cameras again, i.e. when the subject is within the trackbox limits, with the eyes open and facing the eye tracker.

<b>Maximum gaze angle</b>	The maximum gaze angle for which the eye tracker can perform robust and accurate tracking on the eyes. The gaze angle is the angle ABC with A = center of the eye tracker (midpoint between the two eye tracking sensors), B = eye position (midpoint between the left and the right eye) and C = stimuli point.
<b>Maximum screen size</b>	The maximum screen size supported by the standard eye tracker setup (i.e. mounting the eye tracker directly on the screen).
<b>Monocular calibration</b>	Tracks and reports data for only one eye.
<b>Operating distance</b>	The minimum and maximum distances between the subject's eyes and the surface covering the eye tracker sensors at which eye tracking can be done while maintaining robust tracking.
<b>Optimal conditions</b>	Please download the Data Quality Test Report from <a href="https://tobii.com">tobii.com</a> to read more about optimal conditions for this eye tracker.
<b>Precision</b>	Describes the spatial angular variation between individual and consecutive gaze samples (Root Mean Square), calculated on raw data. For more details on how precision is calculated, please read your eye tracker's Data Quality Test Report on <a href="https://tobii.com">tobii.com</a> .
<b>Sampling frequency</b>	The number of data samples per second output for each eye. Expressed in Hz units, where 1 Hz = 1 sample per second.
<b>Total system latency</b>	The duration from the mid-point of the eye image exposure, to when a sample is available via the API on the client computer. This includes half of the image exposure time, image read-out and transfer time, processing time and time to transfer the data sample to a client computer.
<b>Tracker and client time synchronization</b>	The eye tracker and software client clocks can drift naturally during operation. To compensate for this, the Pro SDK will periodically ask the eye tracker about its current time stamp, noting the system time stamp when the request is sent and received. This data is then used to calculate how the system time corresponds to the device time.
<b>Video-based pupil and corneal reflection eye tracking</b>	At the center of this technique is a hardware setup that consists of one or two video cameras and one or multiple sets of infrared-light illuminators. The cameras capture images of the eyes and the illuminators produce reflections on its surface. These images are processed by algorithms that identify the pupil and the reflections caused by the illuminators. This information is then combined with different parameters from a 3D model of the eye and used to map the gaze onto the stimulus.



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## Support for Your Tobii Pro Device

### Get Help Online

Visit Tobii Pro Connect for help with your Tobii Pro device. It contains the latest information about contacting Support, links to our Learning Center, and much more. Visit [connect.tobii.com](https://connect.tobii.com).

### Contact Your Solution Consultant or Reseller

For questions or problems with your product, contact your Tobii Pro sales representative or authorized reseller for assistance. They are most familiar with your personal setup and can best help you with tips and product training.

Visit [tobii.com/contact](https://tobii.com/contact).