



# Introduction to Pupil Invisible in ABL

## 1 Introduction

This manual is to provide information to work with Pupil Invisible (Pupil Labs) Eye tracking glasses in Aalto Behavioral Laboratory (ABL). Further information can be found from Pupil labs webpages:



<https://pupil-labs.com/products/invisible/>




Contact ABL personnel in any trouble.

### 1.1) Equipment

Equipment consists of the head set, mobile phone, charger and cables.

Table 1: The Pupil Labs system

Product	Image
4 x Glasses Pupil Invisible 1-4	 ID: 1: 5JCA7 (SQDFC) 2: P3U57 (XENAS) 3: AFVKS (E37HS) 4: 5FRLK (HNR7M)
4 x Mobile phone Pupil Invisible 1-4	 Model: OnePlus 8 Android 11 IN2013

<p>4 x Power Pupil 1-4</p>	 <p>Model: WC0506A3HK Output: 5.0VAC2.0A, 10.0W tai 5.0VAC6.0A max 30W ID: 1: HD211041A1921925 2: HD211041C1500092 3: HD211041C1502640 4: HD211041C1501039</p>
<p>4 x Transfer cable (USB A-USB C) 4 x Connection cable (USB C – USB C)</p>	
<p>4 x box Pupil Invisible 1-4</p>	

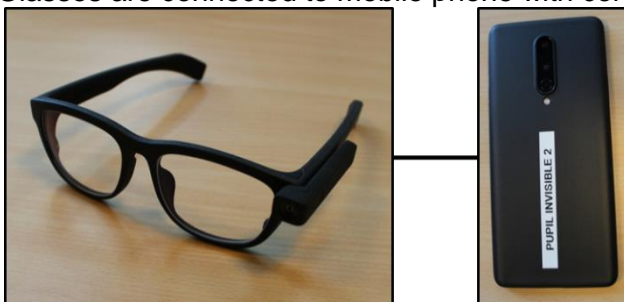


## 1.2) Installation in ABL

Pupil Invisible eye tracker is a remote device and can be used inside and outside the lab. Pupil Labs software (Invisible Companion) are installed on the mobile devices. Mobile phone works on Android system and requires a Google account login. We have created a gmail address, which is logged in on the phone. Ask the PIN number for the phone from the personnel.

## 1.3) Wiring

Glasses are connected to mobile phone with connector cable.



## 2 Usage

### 2.1) Before Measurements

- 1) Connect glasses and mobile phone together with the connector cable

- 2) Turn on the mobile device (right side button)
- 3) Enter PIN-number (ask from personnel)
- 4) Click “Invisible Companion” icon on the desktop
- 5) Choose “Wearer” or “Create New”
- 6) Press “record” button to start recording
- 7) After recording, press “stop” button

## 2.2) After measurements

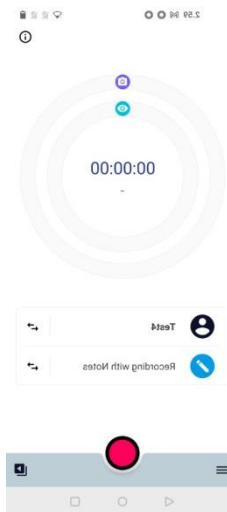
After measurements, log out from your account and close Invisible Companion application. Then close the phone, by pressing the “volume up button” on the left and the right button simultaneously; the option to shut down the phone will appear.

Remove the cables and put everything back into the box.

## 3 Pupil Companion

### 3.1) Wearer

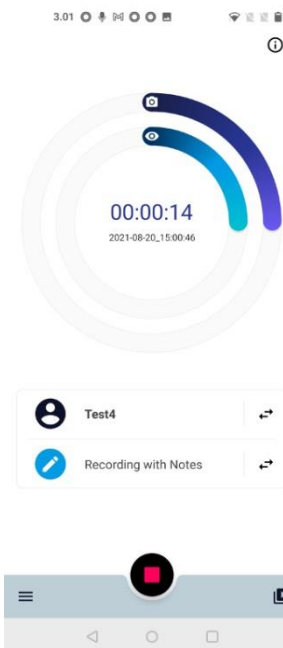
After opening the software, you must choose “wearer”, or create new one.



After that, you can adjust the calibration, by clicking “adjust”.

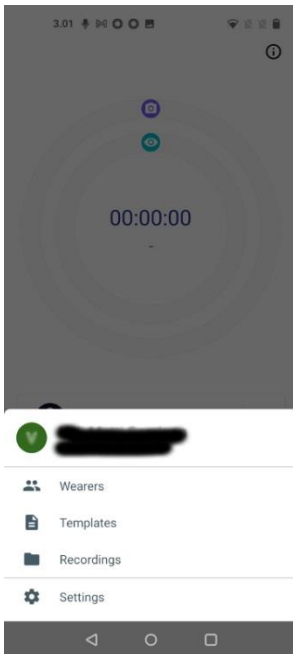


To start recording, press red “recording button”



After recording, press “stop”.

On the bottom left corner, there is a “settings icon”. From there, you can adjust “Wearers”, “Recordings” and “Templates”. In the “Settings” you can turn on the Cloud service, which enables to upload the recordings directly on the cloud service.



Cloud service: <https://cloud.pupil-labs.com/>

### 3.2) Accounts

Pupil Companion app requires a logging. You can use any e-mail of your own. Remember to log out when you are done with your recordings.

### 3.3) Remote viewing

You can view the Pupil Companion application remotely from another computer over WiFi.  
<https://pupil-labs.com/products/invisible/> -> Pupil Monitor -> Download

### 3.4) Simultaneous recording with several glasses

<https://docs.pupil-labs.com/invisible/user-guide/invisible-companion-app/#time-synchronization>

Pupil Companion uses internet clock to synchronize devices together. Make sure that all mobile devices are connected to internet and time settings are active.

## 4 Swappable lenses

Pupil Invisible glasses don't work with corrective glasses, but you can use the prescription set, which has lenses up to  $\pm 3.0$  diopter (0.5 diopter between two lenses).

Removing lenses: <https://www.youtube.com/watch?v=ZaUoyuBEOJo>

Insert Lenses: <https://www.youtube.com/watch?v=Y8hG8t5xiPM>

## 5 Analysis tools

There are several options for analyzing data collected from Pupil Invisible device.

### 5.1) Pupil Cloud

“Pupil Cloud is a service you can use to store, visualize, and enrich your Pupil Invisible recordings.”

If the option Cloud upload (Settings ->Data usage) is enabled in the Invisible Companion, the data will be automatically uploaded to Pupil Cloud Service (<https://cloud.pupil-labs.com/>).

### 5.2) Pupil Player

“Pupil Player is our open-source analysis software originally created for Pupil Core. You can use Pupil Player to open, playback, visualize, and analyze recording made with Pupil Invisible.”

<https://docs.pupil-labs.com/core/software/pupil-player/>

To work with the Pupil Player, you need to download Pupil Invisible data first on your computer. You can do that at least in two ways:

- 1) Connect mobile phone to a computer where the Pupil Player is installed via USB cable. Transfer the data from the “Pupil Invisible Export” folder.
- 2) Upload the data automatically to Pupil Cloud and download the data to a computer from the Cloud service.

Open the Pupil Player and drag your data folder on the gray window.

### 5.3) Pupil Monitor

Pupil Monitor enables streaming Invisible Companion software on external device over Wi-Fi.

#### 5.4) Third-Party Software

The data from Pupil Invisible can be used in third-Party software. Pupil Labs offers direct export to iMotions and Blickshift.

#### 5.5) CSV export

Pupil Invisible data can be exported to CSV and then analyzed in any software of your choice.

### 6 Academic Citation

On the Pupil Labs website (<https://docs.pupil-labs.com/invisible/academic-citation/#papers-that-cite-pupil-invisible>) there are instructions how to cite the Pupil Invisible in the academic publication:

“If you are using are using Pupil Invisible in academic research, please cite the following paper in your publications! For guidance on citing Pupil Core please see here.

A High-Level Description and Performance Evaluation of Pupil Invisible  
Available on arxiv: <https://arxiv.org/pdf/2009.00508.pdf>”

There is also a list of publication done with Pupil Labs devices on their website:  
<https://pupil-labs.com/publications/>