Droplet Lab Knowledge Base

Table of Contents

App Installation **3**
- **How to Download and Install the Droplet Lab Mobile Application for iOS?** **3**
- **How to Download and Install the Droplet Lab Mobile Application for Android?** **6**
- **Setting up Application Permissions** **11**
- **App Activation via QR Code** **15**
- How to Check for App Version and Software Updates? 18

Registration **20**
- **How to Create an Account on Droplet Lab Mobile Application?** **20**

Calibration Process **26**
- **Which Calibrations are needed for measurement?** **26**
  - **Image Calibration Number** **26**
  - **Density Differential** **27**
  - **Acceleration of Gravity** **28**
- **How do I Calibrate the Instrument?** **29**

Projects **32**
- **How to Create a New Project in Droplet Lab?** **32**
- **How to Capture Multiple Images?** **45**
- **How to Archive a Project?** **51**
- **How to Report an Issue?** **53**

Measurement Process **55**
- **How does the Contact Angle Measurement Work?** **55**
- **How does the Surface Free Energy Measurement Work?** **64**
- **How does the Sliding Angle Measurement Work?** **74**
- **How does the Surface Tension Measurement Work?** **85**

Data Management **94**
  - How do I backup my Data? 94
  - How do I import images? 96
  - How do I export the processed images? 98

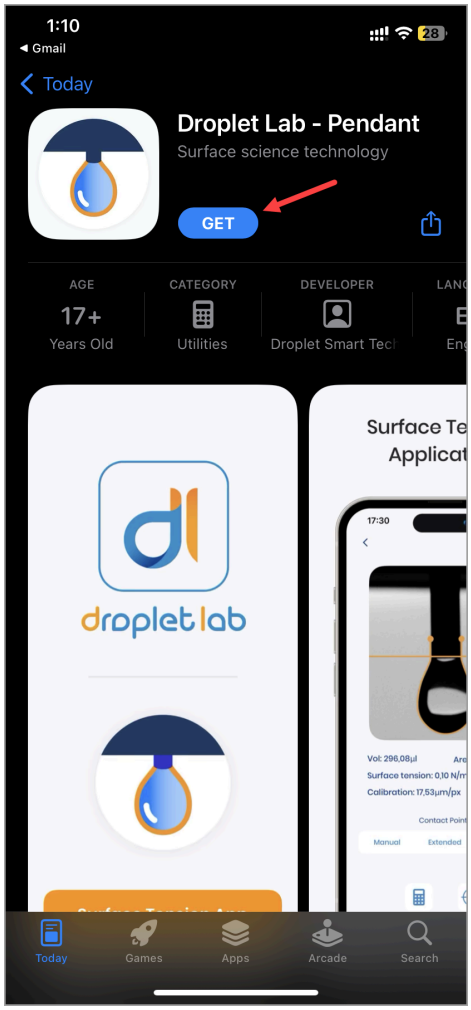
Release Notes **108**
- Ability to Back Up App Data 108
  - How to Backup App Data? 109
- Ability to Calculate Inverted Drops 109
- Bluetooth Indicator on the Image Capture Screen 109
- Bug Resolution 109

Troubleshooting **110**
App does not Start. What Should I Do? 110
What to do if Smart Contact Points cannot Capture the Contact Points Precisely? 115
What to do If Smart Points does not Process the Image Correctly? 115
What to do if the App Activation QR is not Working? 116
How can I Work Offline? 116
I Forgot my Password and Secret Answer. What should I Do? 116
What to do if I Cannot Locate the Image I want to Upload? 116
The Image is not Focused During Photo Capture 116
During Photo Capture, the Image is Too Bright or Too Dark 116
What to do if the Connection to Injector/Platform Device is Red? 117
What to do if the Injector/Platform is not Moving? 117
Batch calculation does not work correctly for images taken in different sessions 118
What to do if the calculation with Young Laplace method is not consistent? 118
How to Assemble the Automatic Dropper & Sliding Stage? **118**
Hardware **119**
Mobile Application **125**

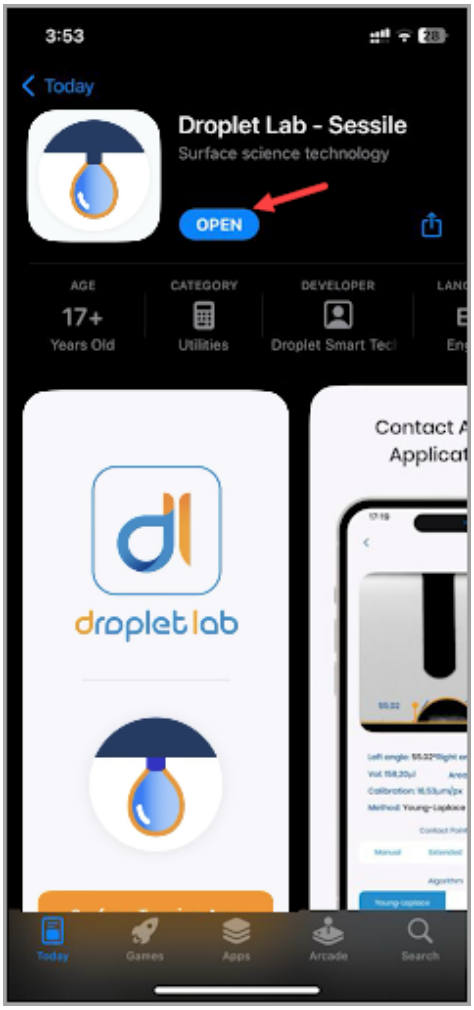
App Installation

How to Download and Install the Droplet Lab Mobile Application for iOS?

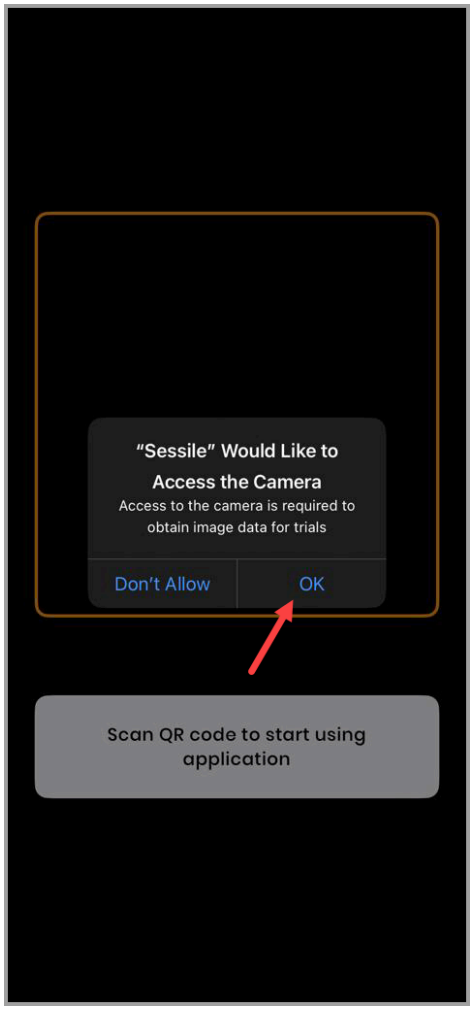
1. Use the https://apps.apple.com/us/app/droplet-lab-sessile/id6445823509 and https://apps.apple.com/us/app/droplet-lab-pendant/id6445823559 URLs to land on the App Store screen with the application displayed.
2. To start download, tap the GET button. Doing so asks for the Face ID since it is the first time you are downloading the application.



3. Once verified, tap the OPEN button. This initiates the app installation.



4. Once installed, the app is displayed on the home screen. Tap the app icon to open the application.
5. As you tap the icon, the application asks for camera permissions. Tap the OK button.

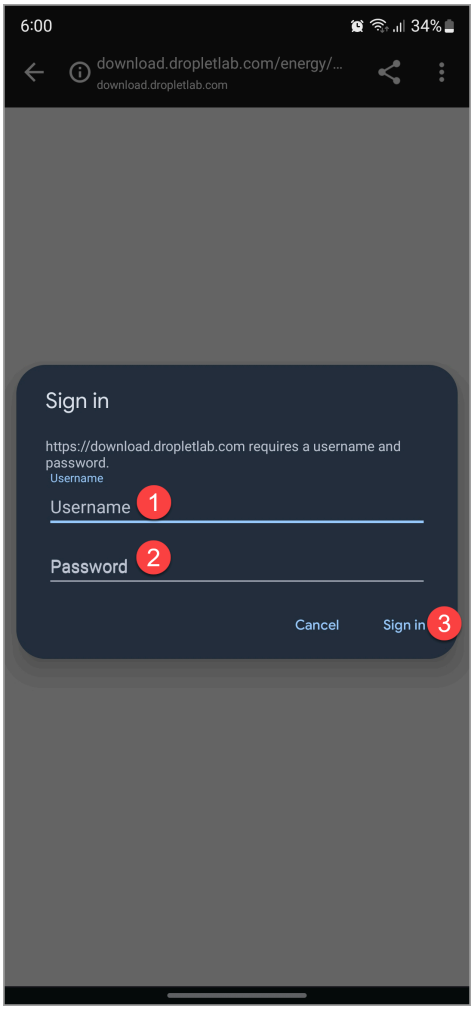


How to Download and Install the Droplet Lab Mobile Application for Android?

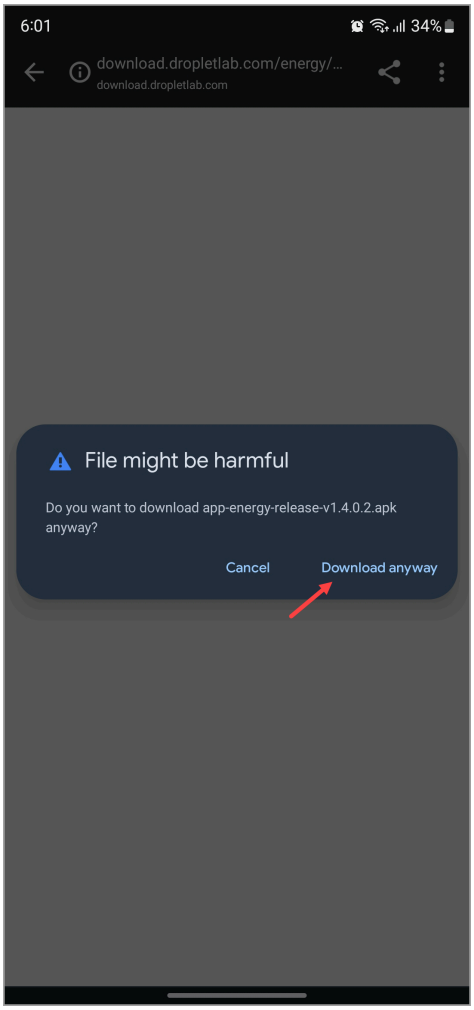
Unlike iOS, the Droplet Lab mobile app is currently not available on the Play Store. Therefore, you need to download the .apk file in order to install the app on your Android phone. Let us take a look at how it is done.

1. Use the https://download.dropletlab.com/ URL to land on the download link.
2. From here, choose the app you want to download.

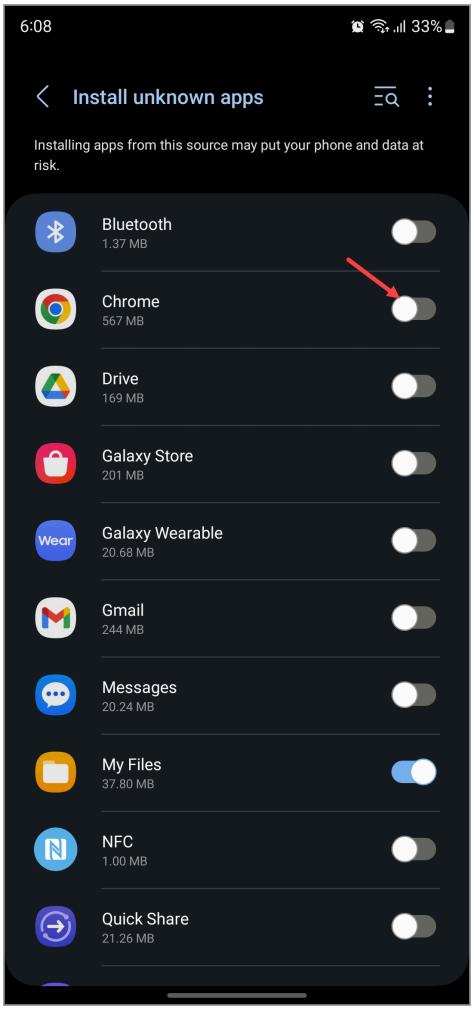
3. As you tap the required type, a popup is displayed asking for login credentials.
4. Here, enter the provided username in the Username field.
5. Enter the corresponding password in the Password field.
6. Once the credentials are entered, tap the Sign In button. This initiates the download and displays a warning popup asking for download confirmation.



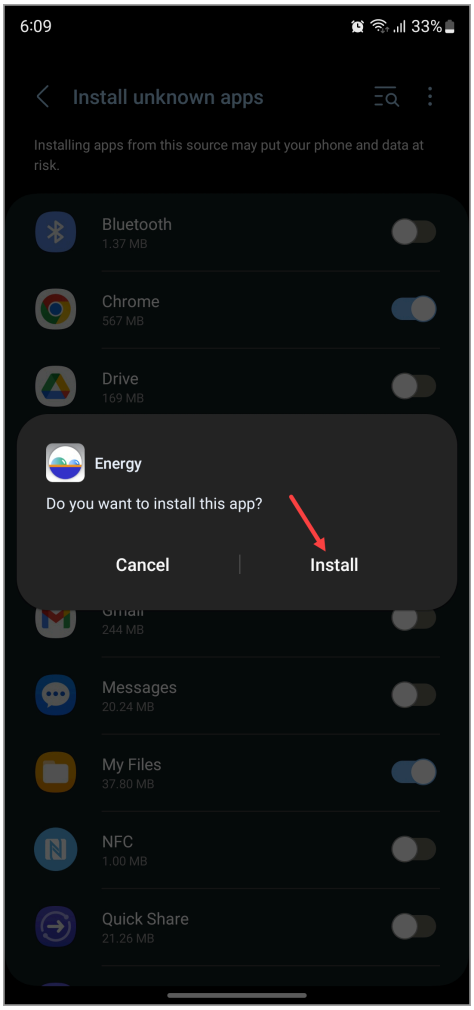
7. From this popup, tap the Download anyway button.



8. As the download completes, a security popup is displayed by Chrome that your phone is not currently allowed to install unknown apps. From this popup, tap Settings. This opens the Install unknown apps screen.
9. Here, enable the Chrome toggle. This displays a popup for app installation confirmation.

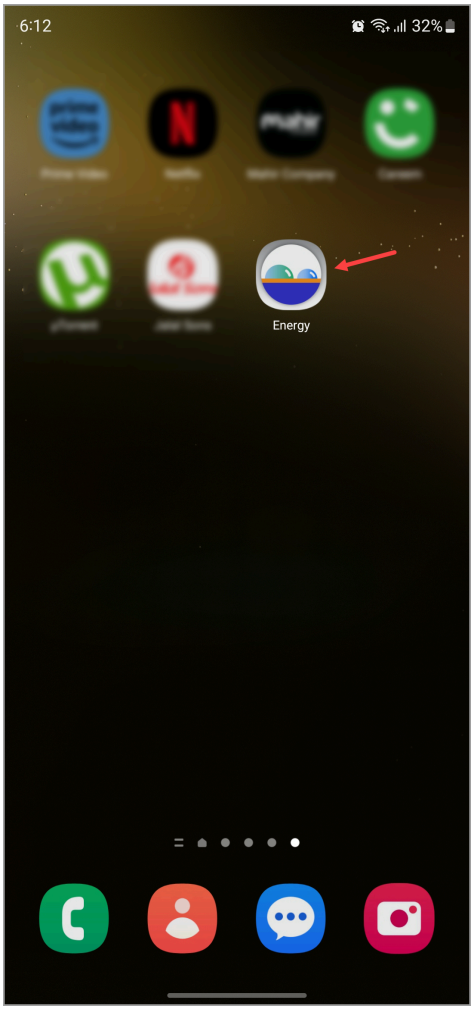


10. To start installation, tap the Install button. As the app is installed, the app icon is displayed on your Android phone screen.

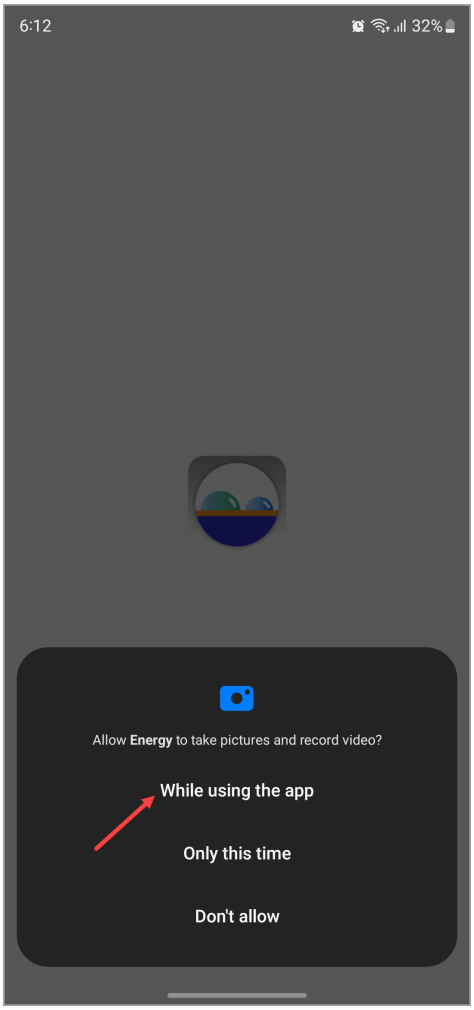


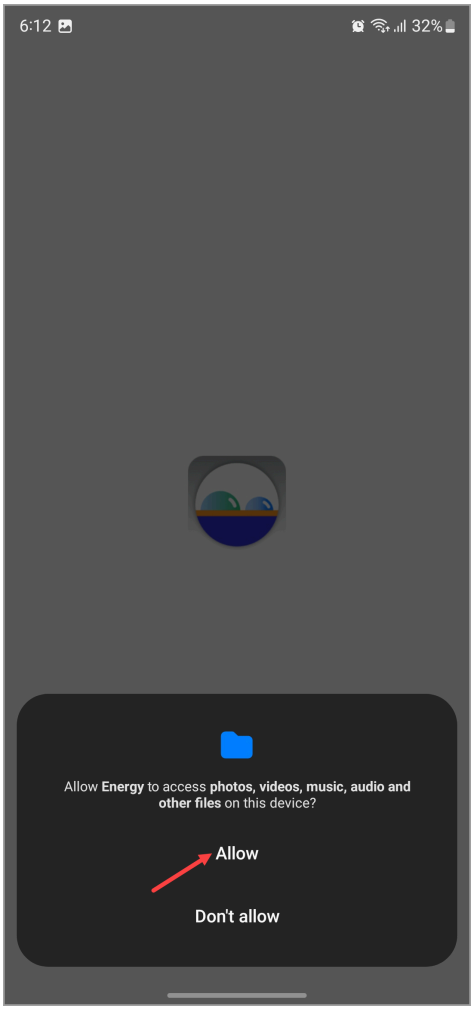
Setting up Application Permissions

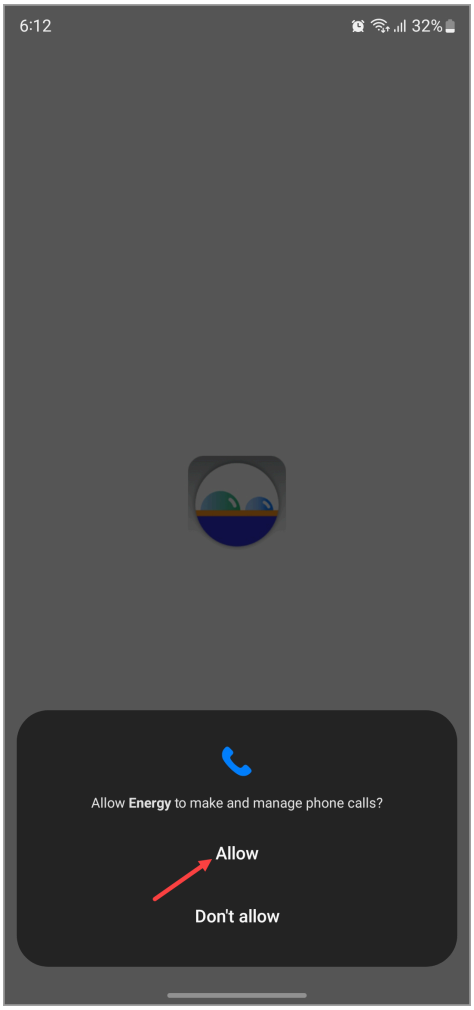
1. Once the app is downloaded, tap the app icon from the home screen to open the application.



2. As the app opens, it asks for a number of permissions it requires to run. They include the permission to access the device camera so that droplet images can be captured, access system storage so that you can import images, and manage phone calls so that the device's unique identifier can be accessed to activate the app. To enable each permission, tap the Allow button.


6:12
32%
Allow Energy to take pictures and record video?
While using the app
Only this time
Don't allow

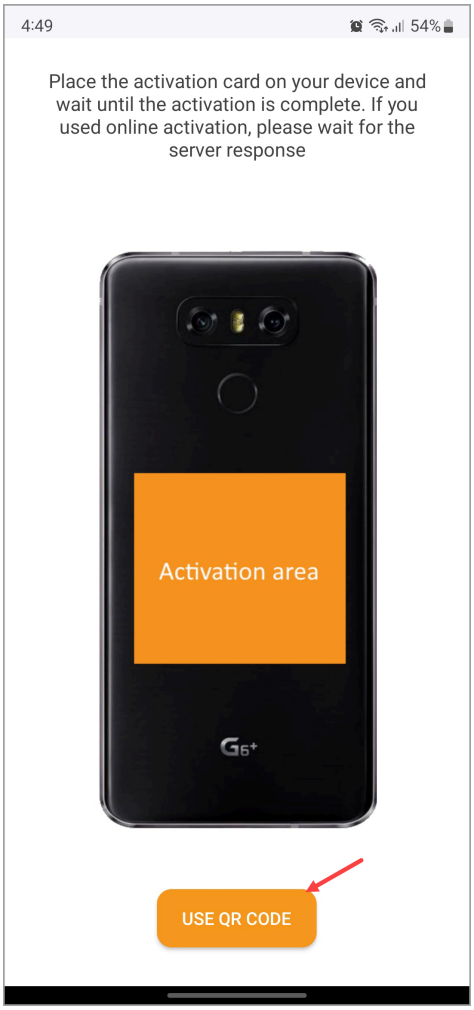

6:12
32%
Allow Energy to access photos, videos, music, audio and other files on this device?
Allow
Don't allow



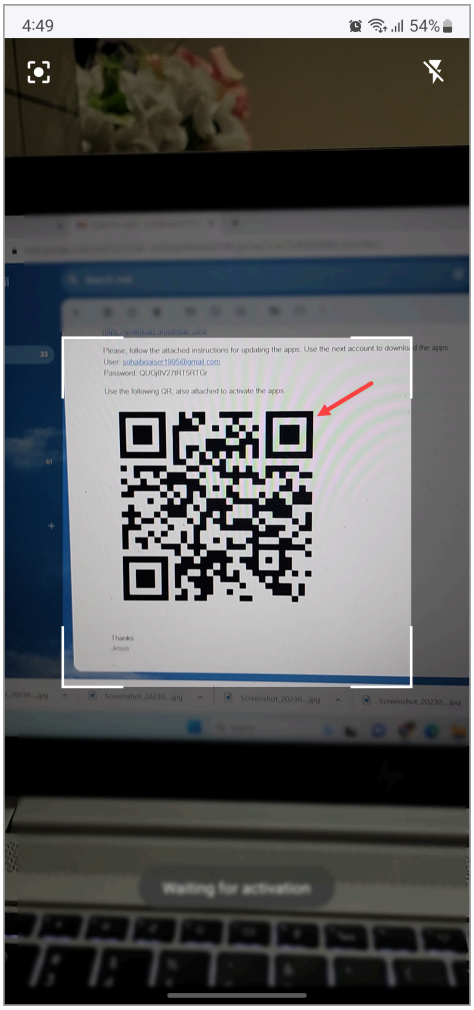
3. As the permissions are allowed, you are taken to the application's landing screen.

App Activation via QR Code

1. Once you land on the application's main screen, tap the USE QR CODE button. This opens your phone's camera for a QR code scan. The app needs to be connected to the internet for the first time its activated

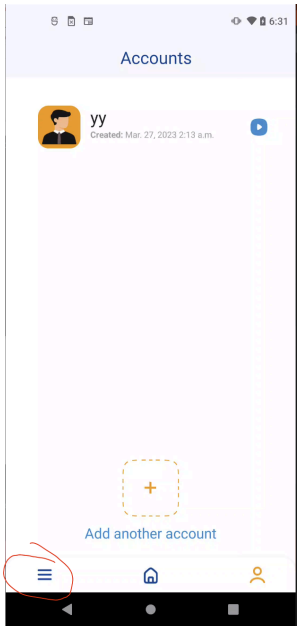


2. Scan the provided QR code. Once scanned, it takes you to the Accounts tab of the Droplet Lab application.

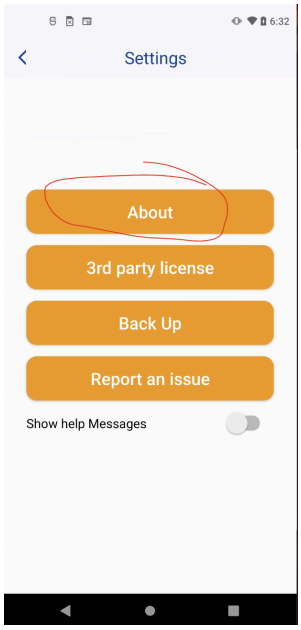

4:49
54%
Please, follow the attached instructions for updating the apps. Use the next account to downlo d the apps:
User: sohaibqaiser1995@gmail.com
Password: QUQ8V2NRT5RTGr
Use the following QR, also attached to activate the apps.
Thanks
Jesus
Waiting for activation

How to Check for App Version and Software Updates?

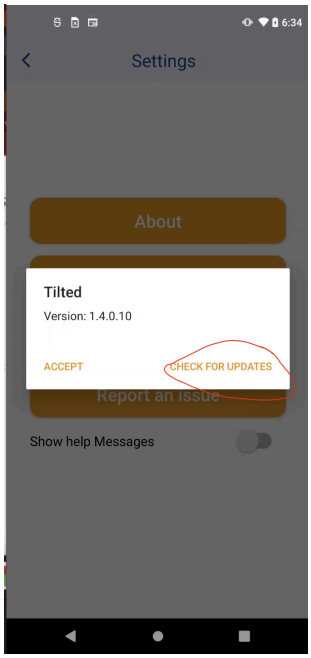
1. From the app's landing screen, tap the three-line icon located at the bottom-left corner of the screen.



2. From the options displayed, click About. Doing so reveals a popup displaying the current version of the application.



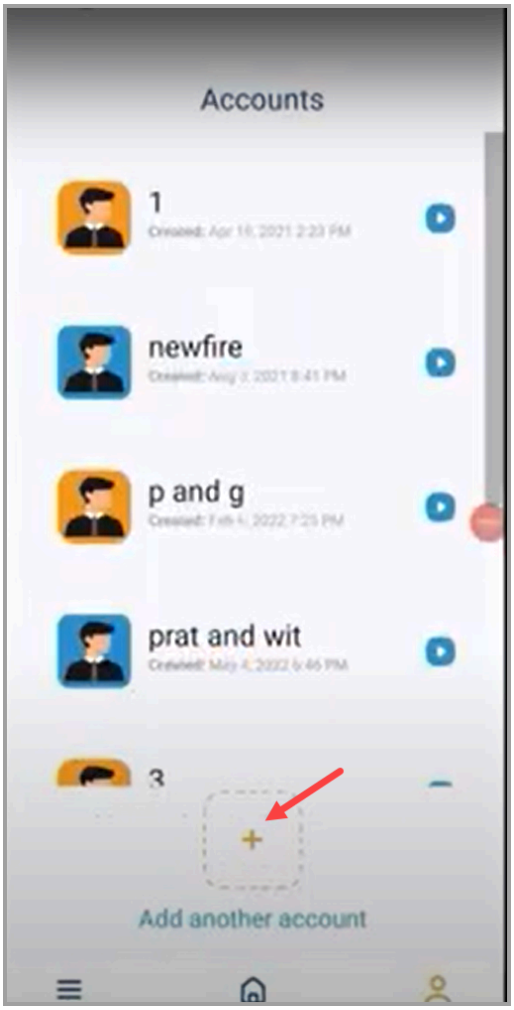
3. To check for updates, click the Check for Updates button.



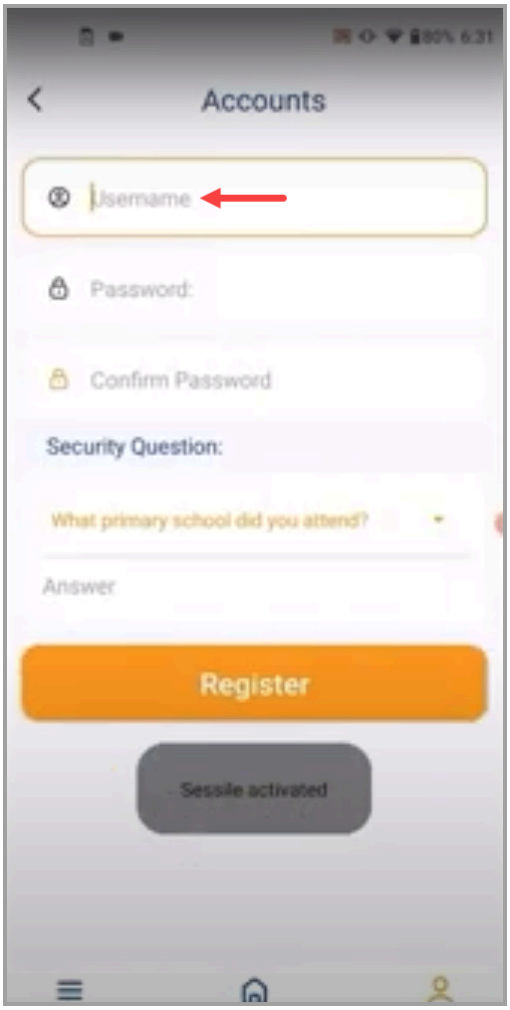
Registration

How to Create an Account on Droplet Lab Mobile Application?

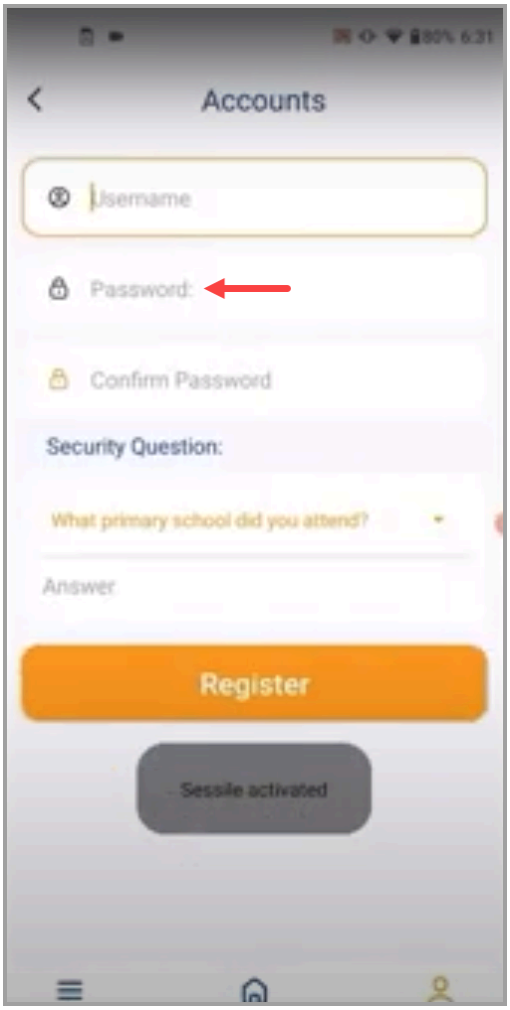
1. From the Accounts screen, tap the + button above the Add another Account heading. Doing so opens the Accounts screen.



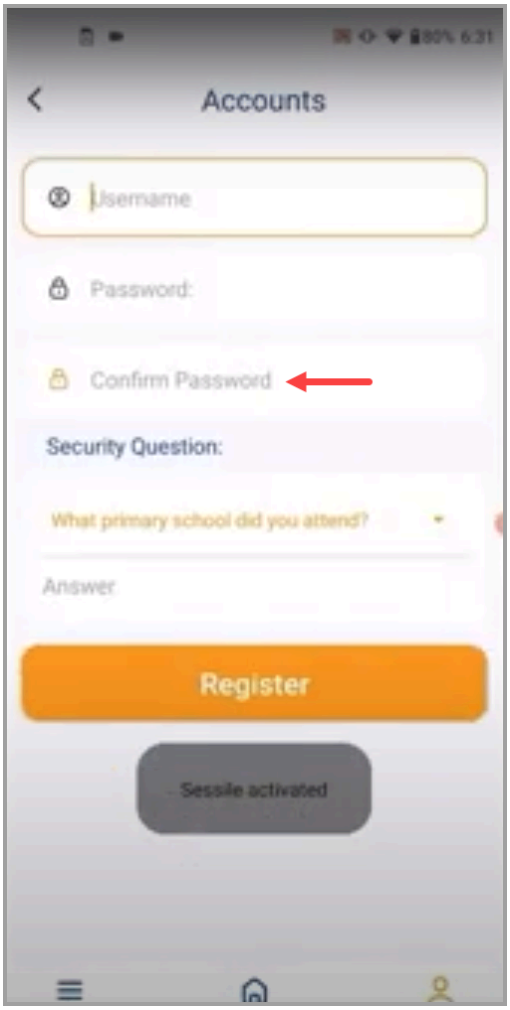
2. Use the Username field to enter the username with which you want to register on the application.



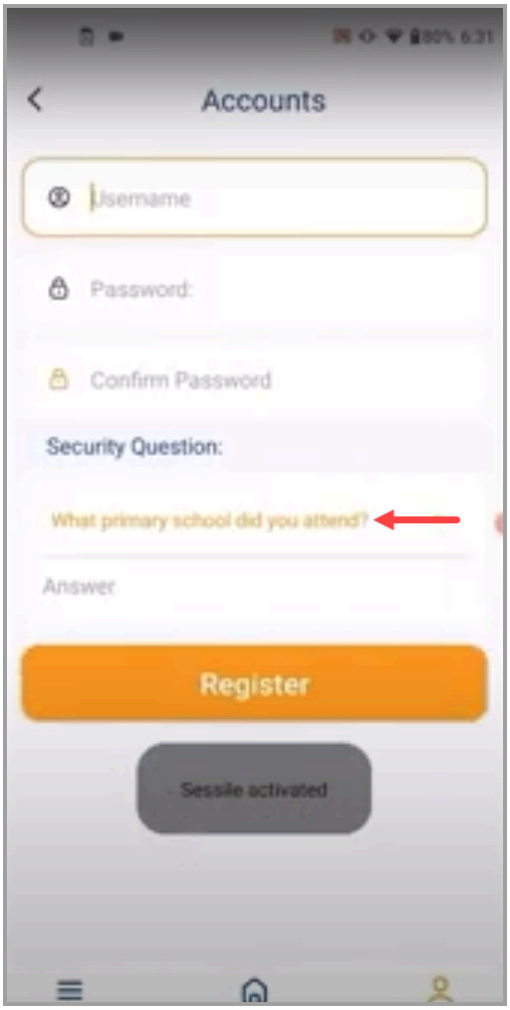
3. Enter the password associated with the username in the Password field.



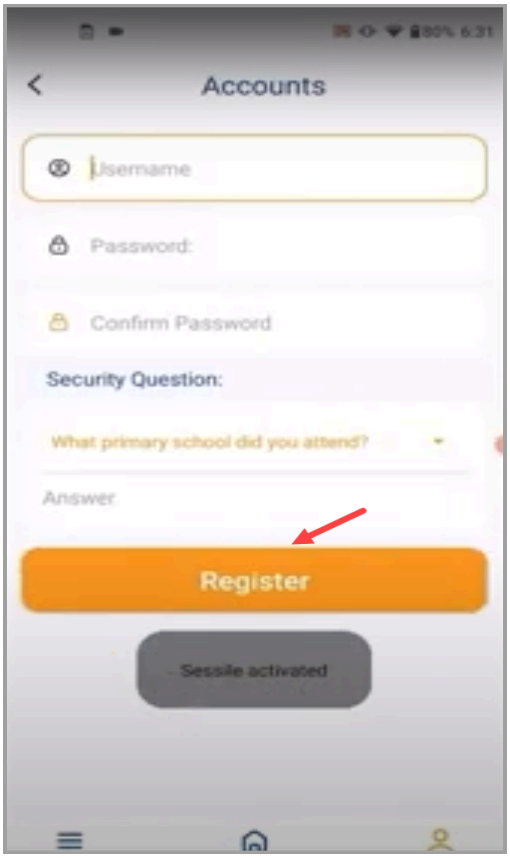
4. For confirmation, re-enter the password in the Confirm Password field.



5. Create a security question for account recovery using the Security Question field.



6. Once the required details are filled in, tap the Register button.



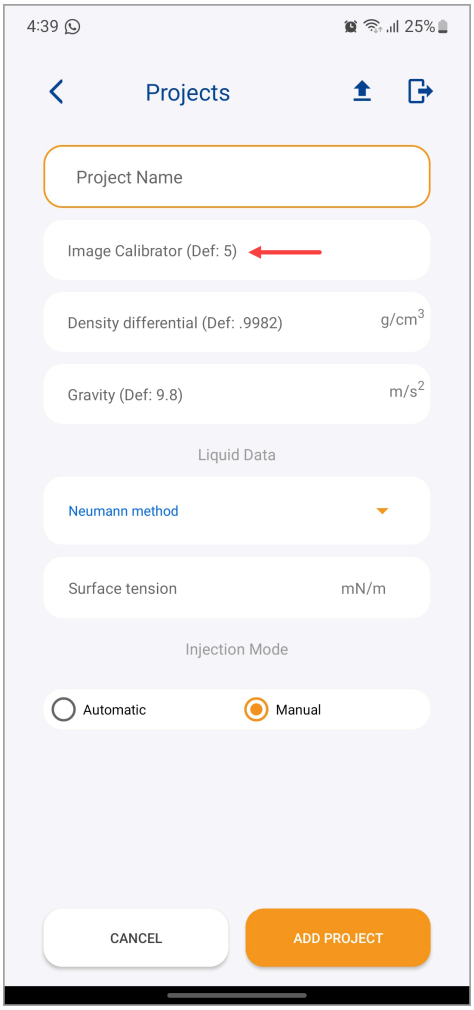
Calibration Process

Which Calibrations are needed for measurement?

In order to ensure smooth contact angle measurement, a number of calibrations are needed. However, they are only needed if you are using the Young-Laplace method. They include:

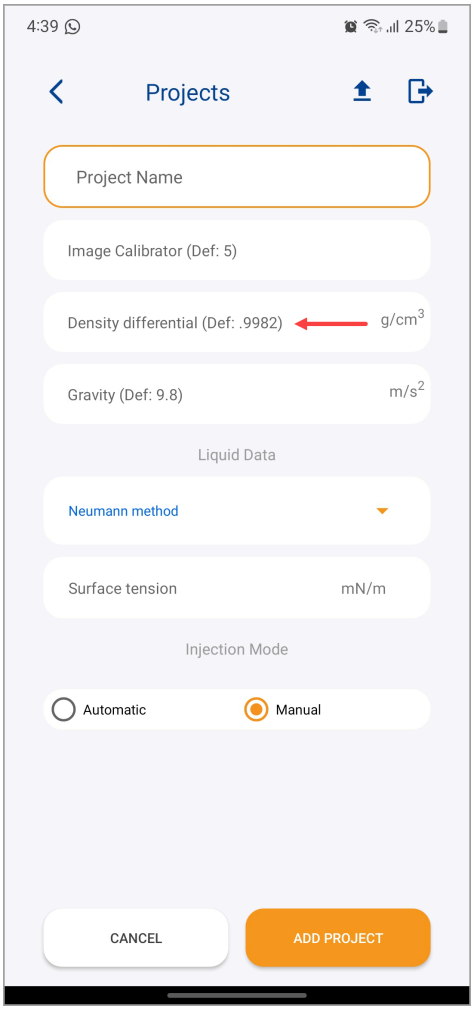
Image Calibration Number

Image calibrator is defined as the outside diameter of the needle you are using for measurement. It is recommended to measure the needle diameter with a micrometer prior to starting the experiment.



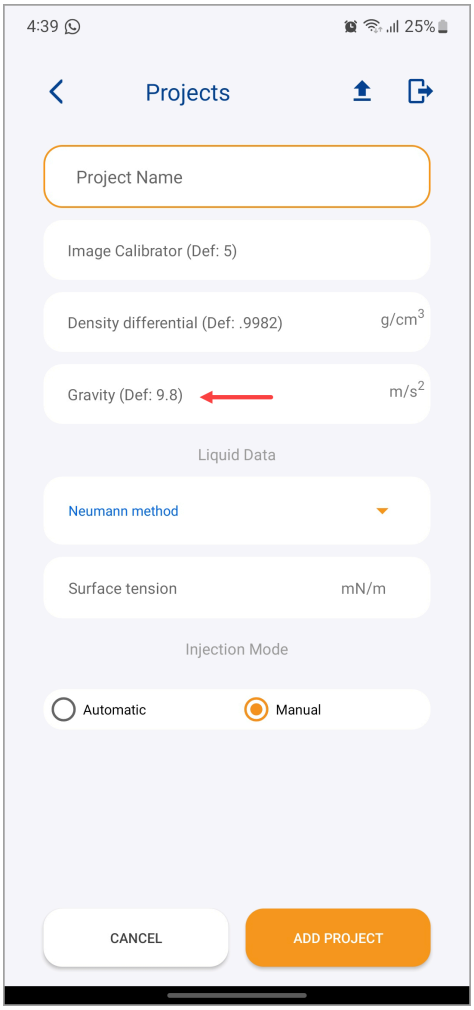
Density Differential

Density differential is defined as the difference between the density of the liquid and the one of its outer gas or liquid. For instance, if you are performing an experiment that includes water and air, you can leave the density differential to its default value. Talking about the experiments that include liquid and liquid (water and oil), the density differential is the difference between the density of oil being used and the density of water.



Acceleration of Gravity

The acceleration of gravity is set to its default value i.e. 9.8 m/s². Use negative values for gravity when doing experiments with buoyancy.



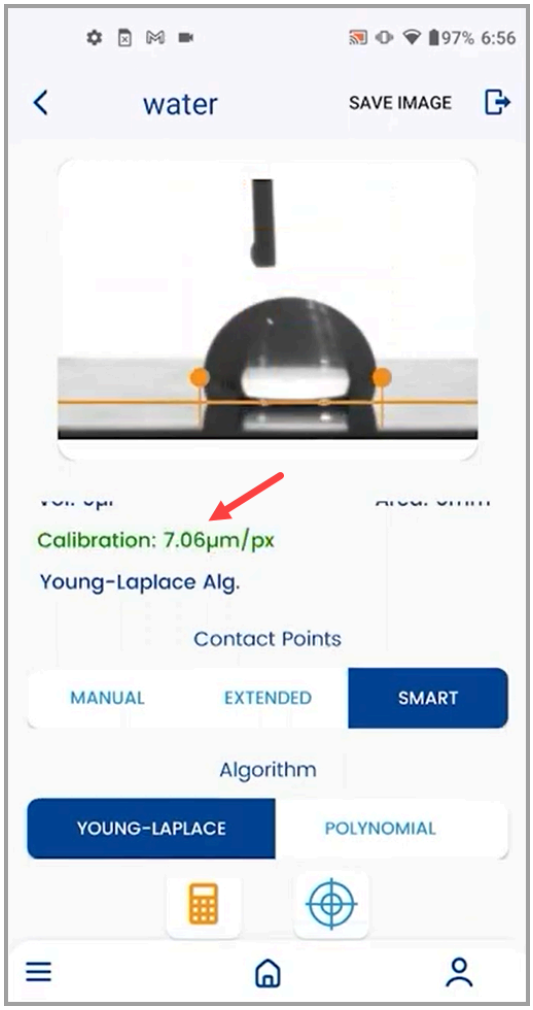
How do I Calibrate the Instrument?

The instrument can be calibrated once you have captured the droplet image using the capture feature available in the projects. Only the Young Laplace method requires calibration. This method is the recommended method for axi-symmetric drops and it averages out the difference between left and right contact angles.

1. Once the image of the droplet is captured, the image preview is displayed along with all the calibration details.

2. The needle needs to be outside the captured droplet unlike for the polynomial method.
3. After that, the calibration process comes into play. Starting off, drag the orange colored points present to the left and right side of the needle.

4. Once the points are adjusted on both sides of the needle, tap the button.
5. The calibration value is then displayed on the screen. If it is displayed in green, it indicates that the calculated number is correct.

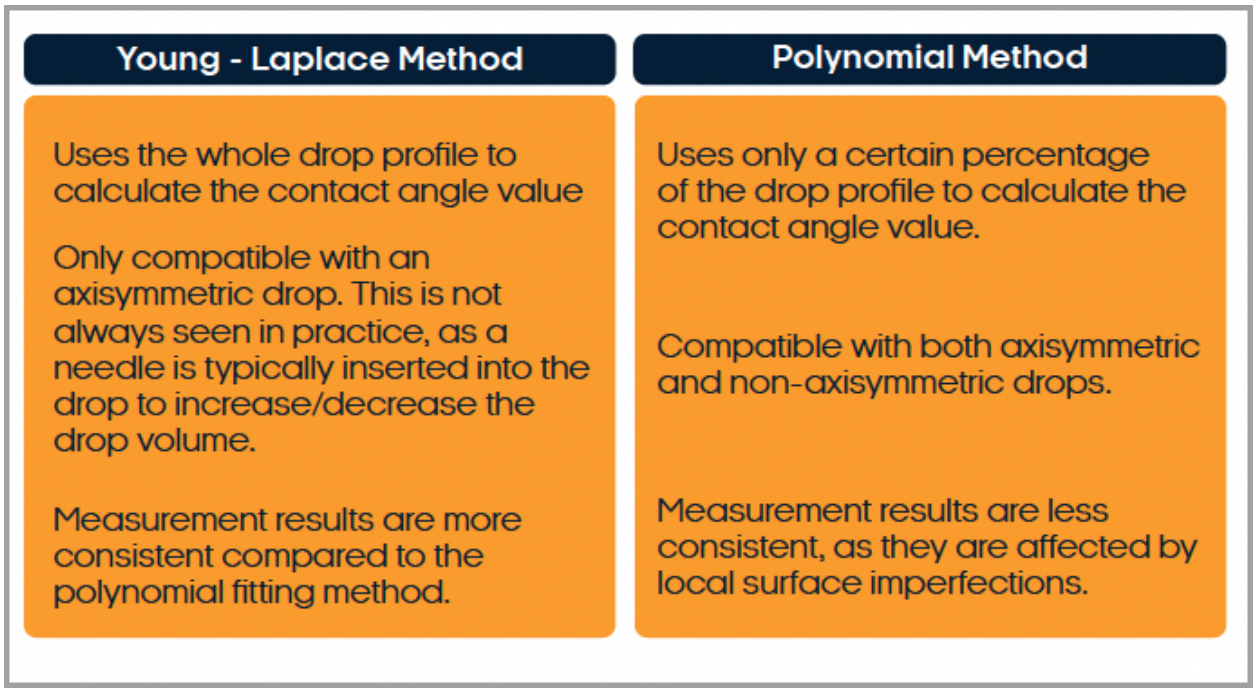


6. However, the calibration value being displayed in yellow or red color indicates an issue with the calibration. In this scenario, the drop is most likely too far away from the camera. We recommend to deposit the drop as possible to the camera as the maximum focus allows which is the maximum value of the focus slider. Alternately it is an error with the image calibration number; measure the needle thickness and try the calibration process again.

Tip: The lower the value of the calibration, the better it is for obtaining precise results in measurement.

What is the Difference between Polynomial and Young Laplace Method?

The table below highlights the key differences between Polynomial and Young Laplace methods.

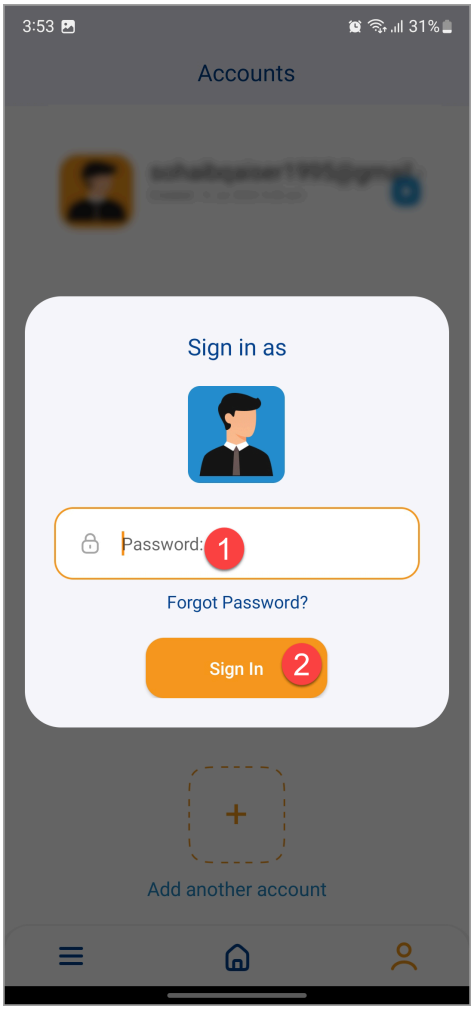


Projects

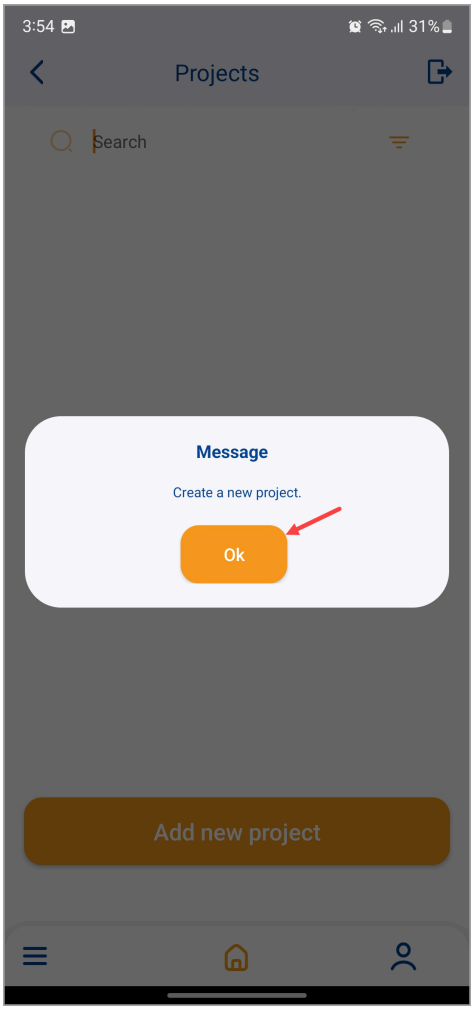
How to Create a New Project in Droplet Lab?

1. Upon account creation, select the account you want to use by tapping the account name.

2. As the account is selected, the app asks you for your account password in order to sign in to the selected account. Enter the password in the Password field and tap the Sign In button.

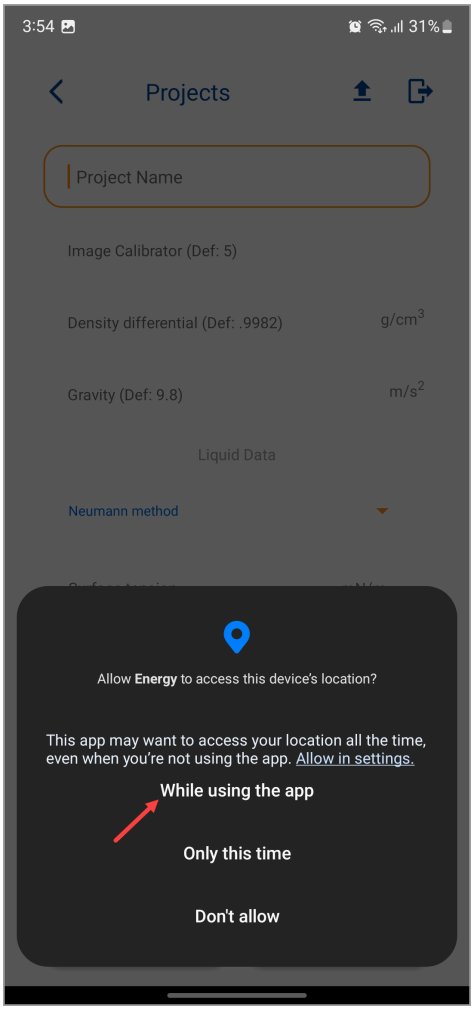


3. A successful sign in takes you to the Projects screen. When there are no added projects, a message box is displayed that says create a new project. From this message box, tap the OK button.

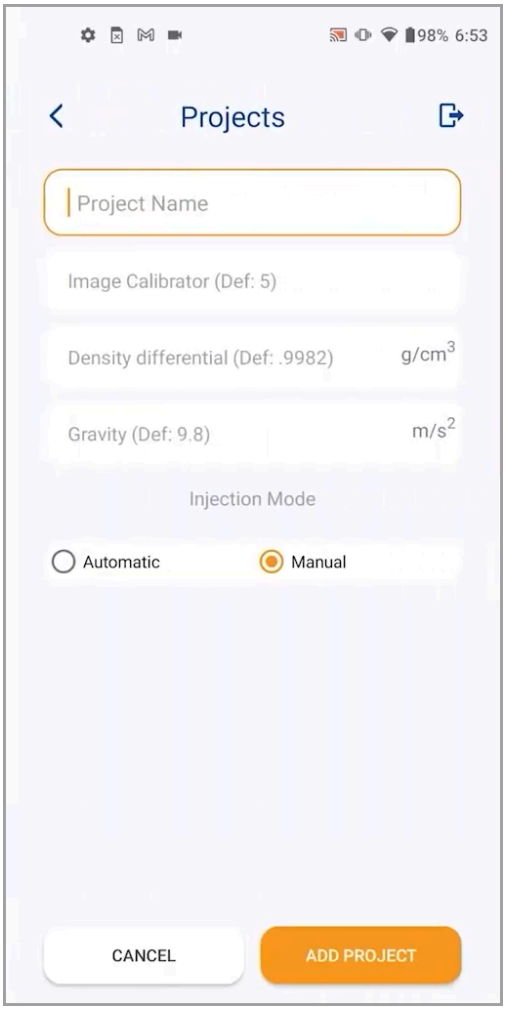


4. From the Projects screen, tap the Add new project button.

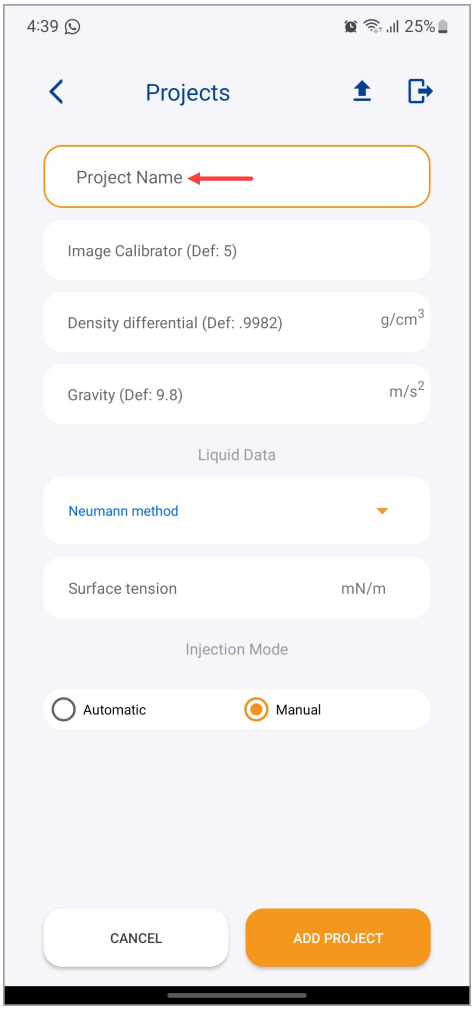
5. As a result, you land on the project creation screen. For the first time, the application asks you for location permissions by displaying a popup as you land on the project creation screen. The location permission is required by the Android system so that it can use Bluetooth for automatic dropper detection. To enable, tap the “While using the app” button.



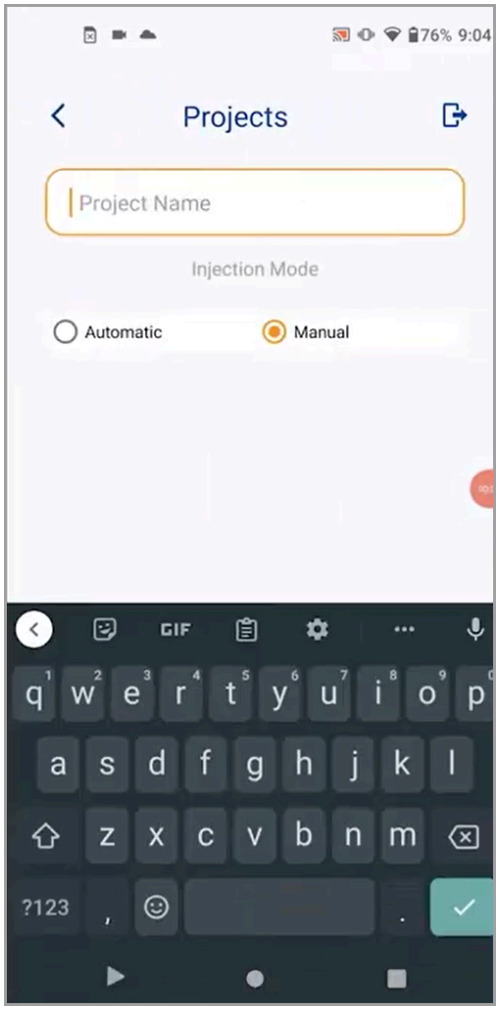
6. Then it comes to project creation. Starting off, use the Project Name field to enter the name of the project.
7. The project creation screen for Contact Angle Measurement looks as follows:



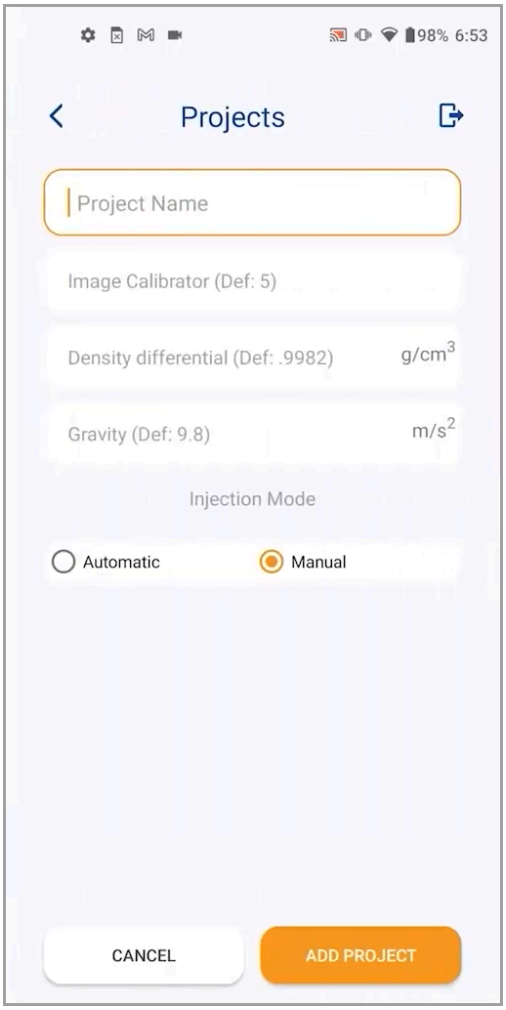
8. For Surface Free Energy Measurement, this screen looks like below:



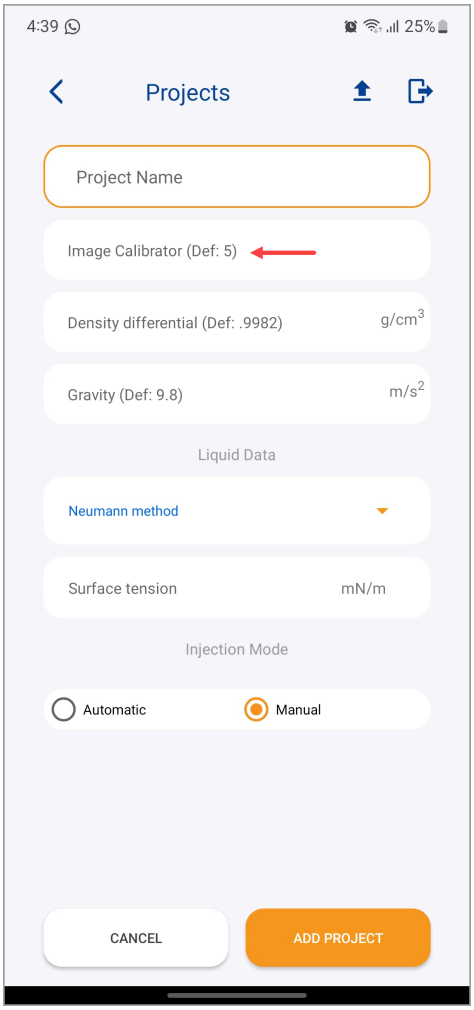
9. For sliding angle measurement, the project creation screen looks like below:



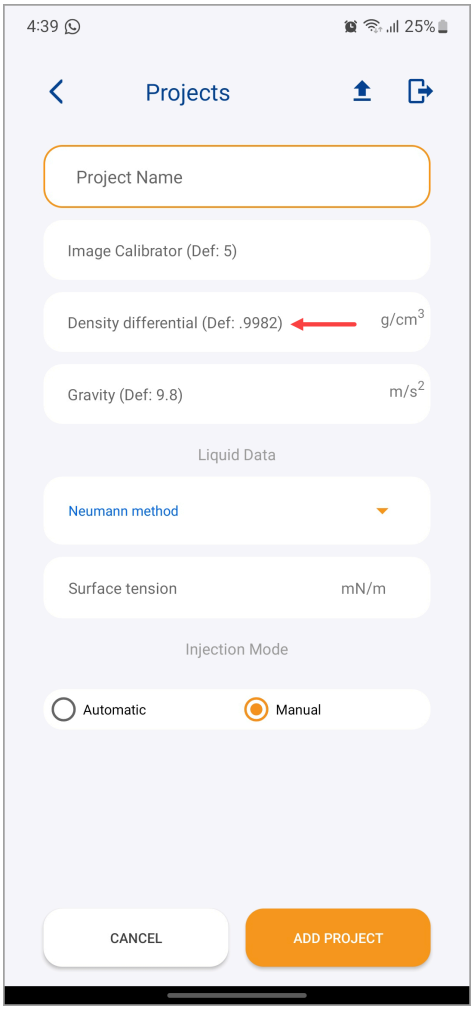
10. For Surface Tension measurement, the screen is similar to the one displayed for contact angle.



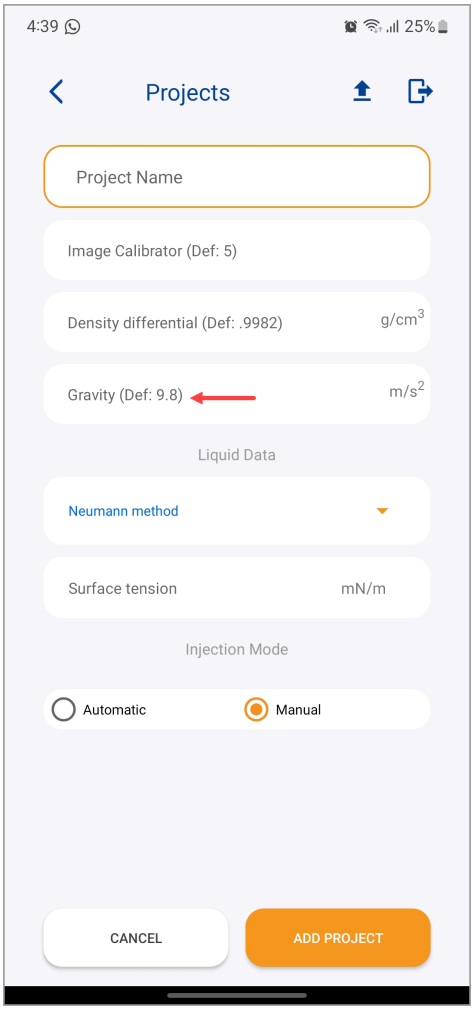
11. Enter the image calibrator measurement in the Image Calibrator field. This is defined as the outside diameter of the needle.



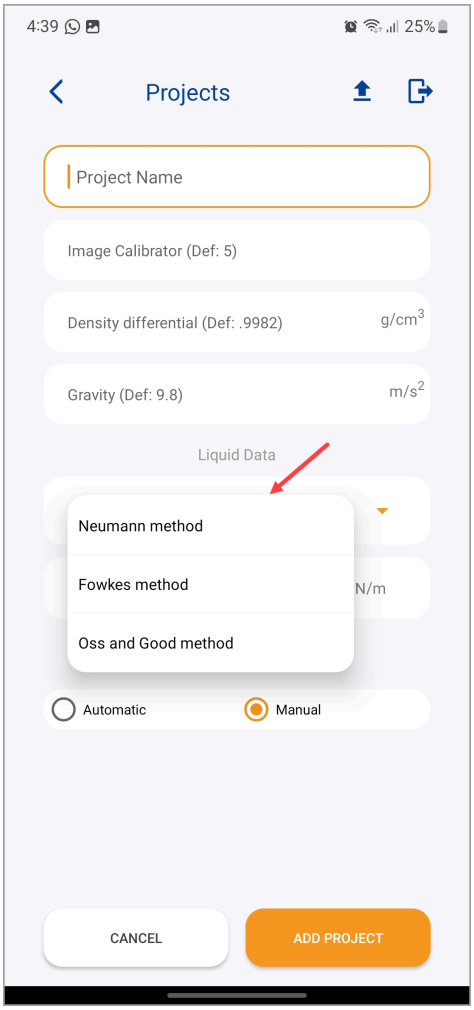
12. Similarly, use the Density differential field to record the density differential.



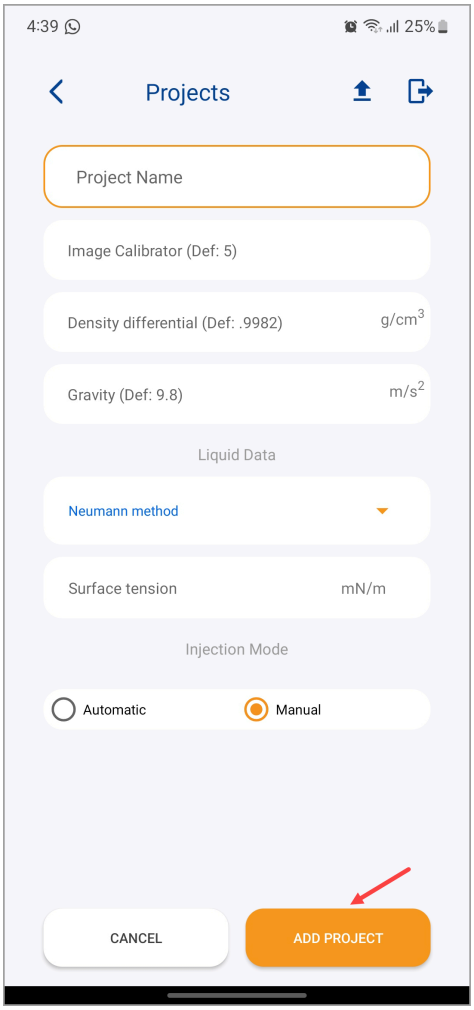
13. Moving further, record the gravity using the Gravity field.



14. For Surface Energy measurement, the Neumann method is selected by default. You can use the measurement method dropdown to choose between Neumann, Fowkes, and Oss and Good methods.



15. Once the required selections are made, tap the Add Project button.

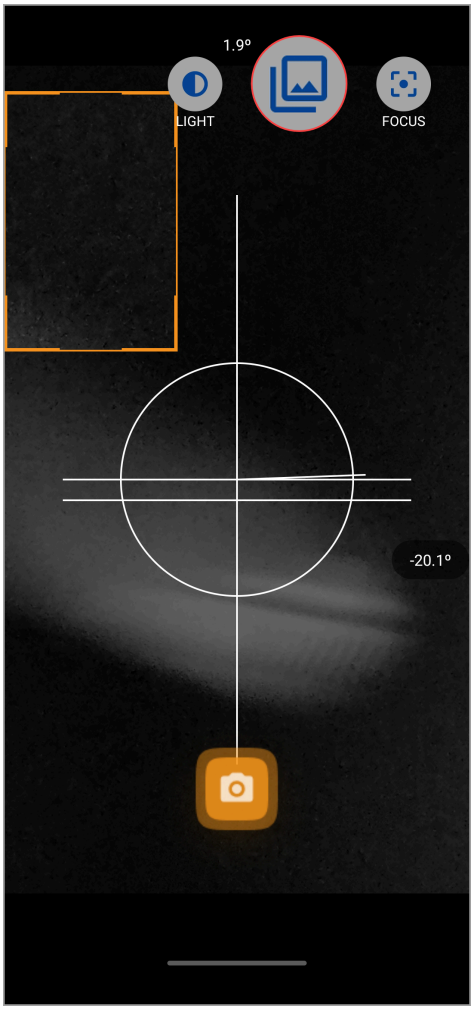


How to Capture Multiple Images?

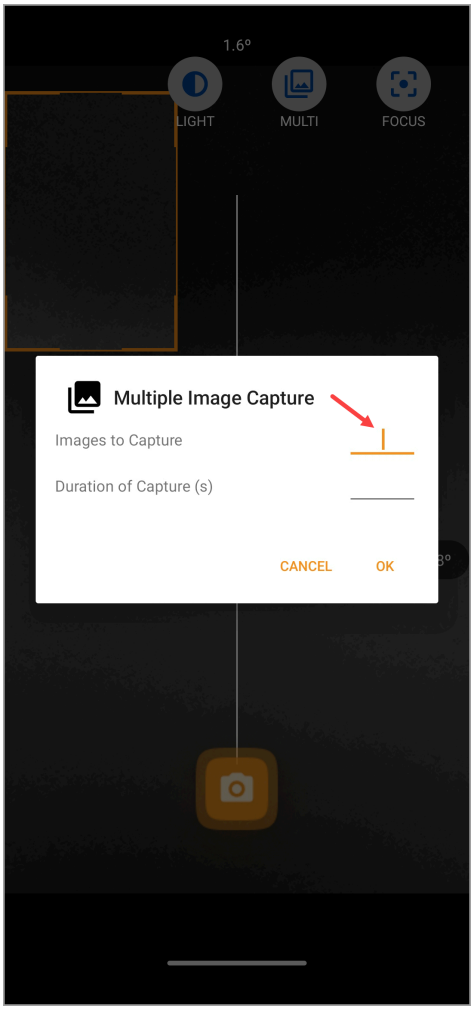
1. Once you have created a project, choose that project by tapping the project name from the Projects screen.

2. As the project opens, tap the camera icon located at the bottom-left corner of the screen. Doing so opens the camera for you to capture images.

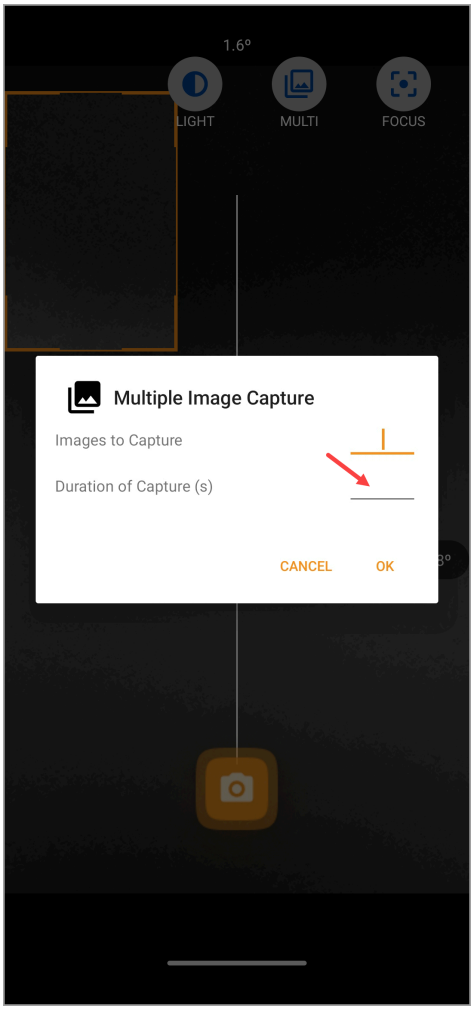
3. As the camera opens, tap the MULTI icon located at the top-right corner of the screen.



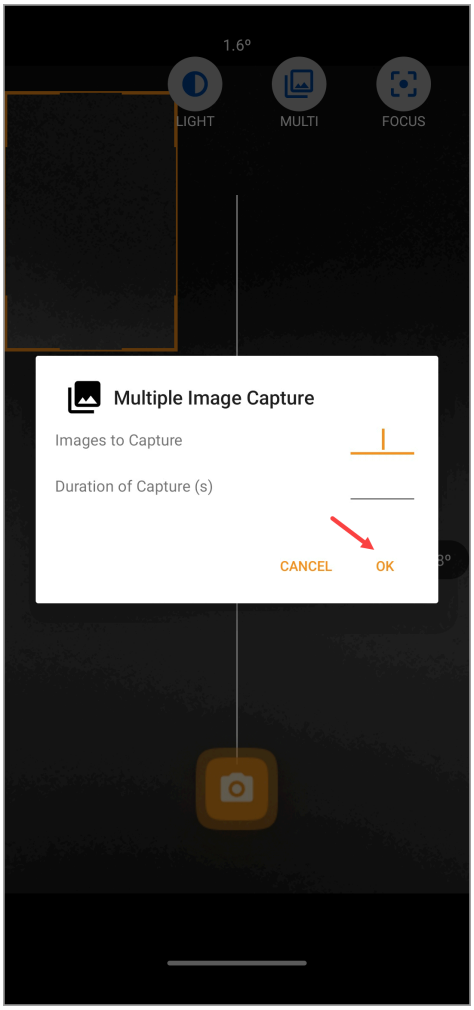
4. As a result, the Multiple Image Capture popup opens. Here, use the Images to Capture field to define the number of images you want to capture.



5. Enter the duration for capture(s) using the Duration of Capture(s) field.



6. Once the required information is filled in, tap the OK button.



How to Archive a Project?

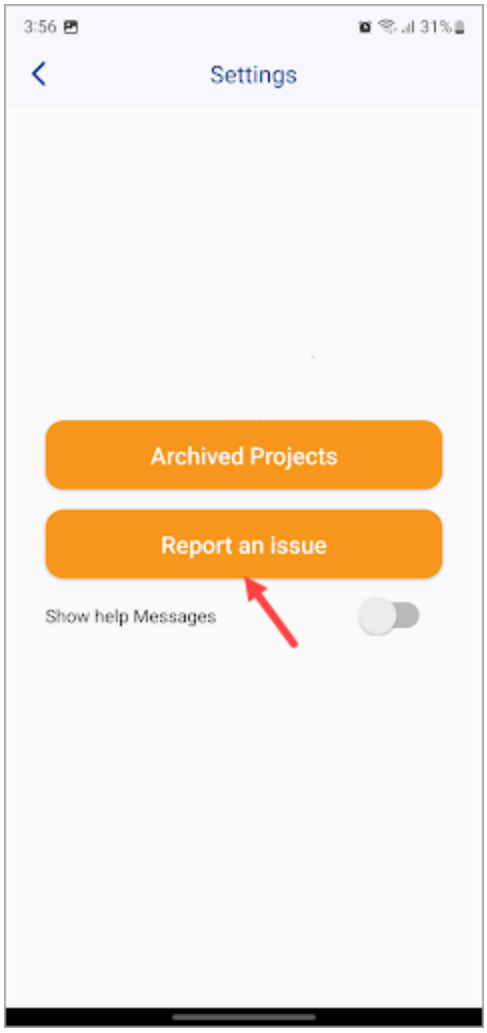
1. From the Projects screen, long press a project you want to archive. Doing so selects the project and a checkbox appears at the right side displaying that the project has been selected.

2. Upon selection, tap the Archive Project button displayed at the top-right corner of the screen.

How to Report an Issue?

1. Upon landing on the app home screen, navigate to the bar displayed at the bottom of the screen.
2. From here, tap the three-line icon at the extreme left.

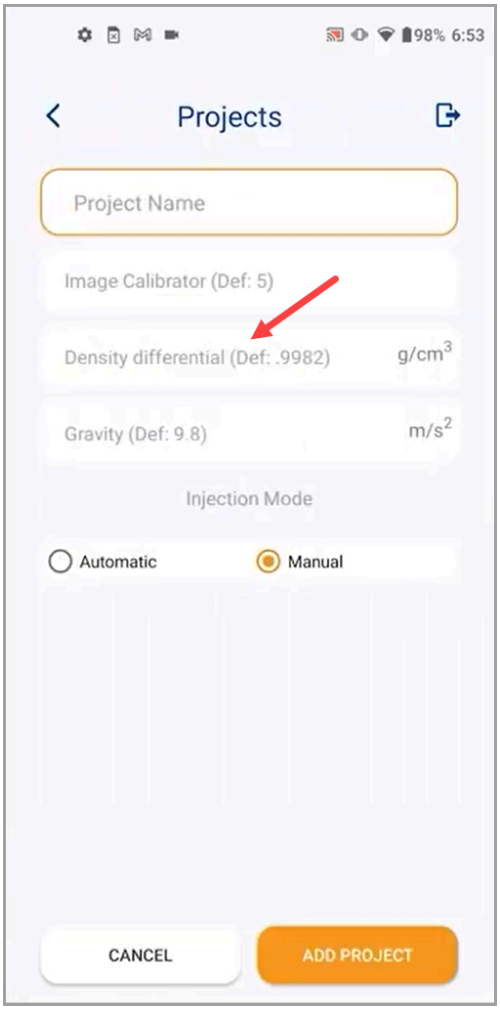
3. This takes you to the Settings screen. Here, tap the Report an Issue button. This opens your email account with the Droplet Lab's support email automatically populated in the recipient field.
4. Type a subject for your issue and use the email body to describe the issue.



Measurement Process

How does the Contact Angle Measurement Work?

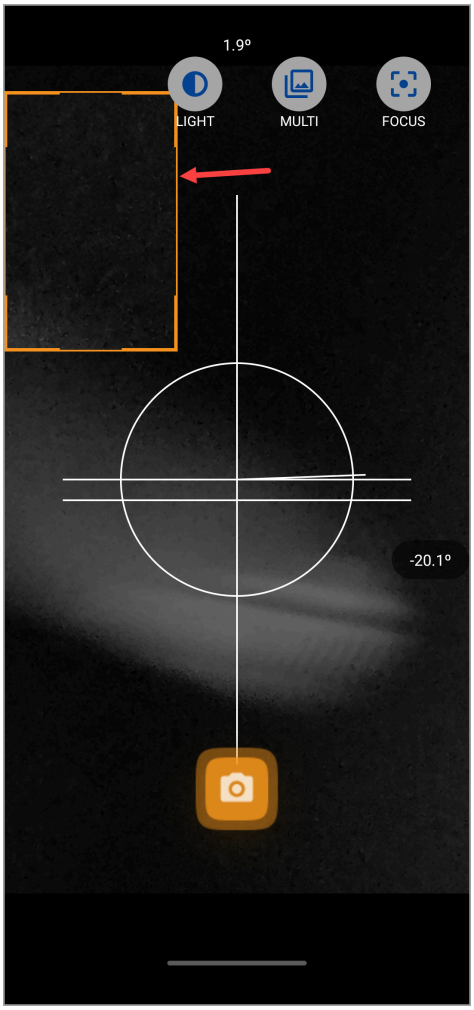
1. The contact angle measurement starts off with project creation as explained in the How to Create a New Project article.
2. While creating the project, make sure that you leave the density differential to its default value since the experiment does not include liquid and liquid.



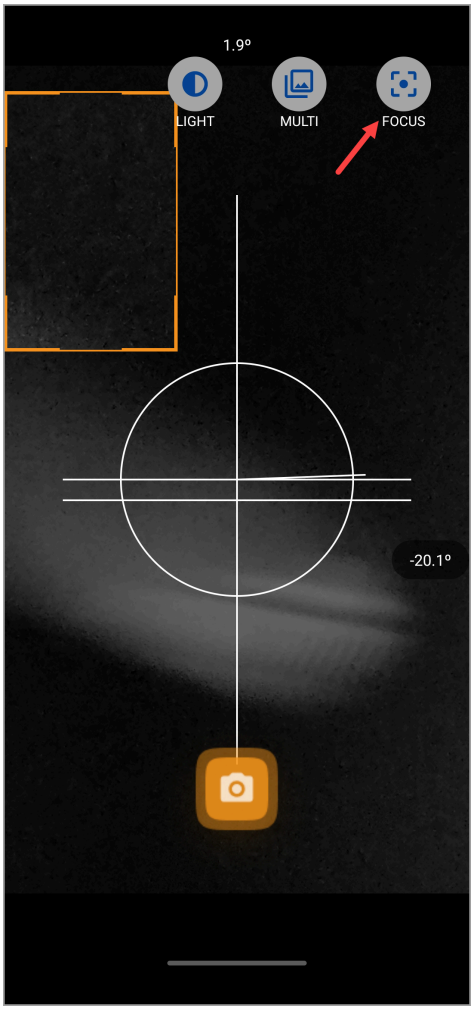
3. Once the project is created, tap the project tile to open the selected project.

4. From the screen that follows, tap the capture image button located at the bottom-left corner.

5. As the camera opens, adjust the distance from the needle in a way that you do not lose focus.
6. Drag and adjust the orange box to select the area you want to capture.



7. To ease it out, tap the Focus button atop the screen so that you can adjust the focus slider in order to obtain the best results. You need to be as close to the droplet as possible without losing focus.



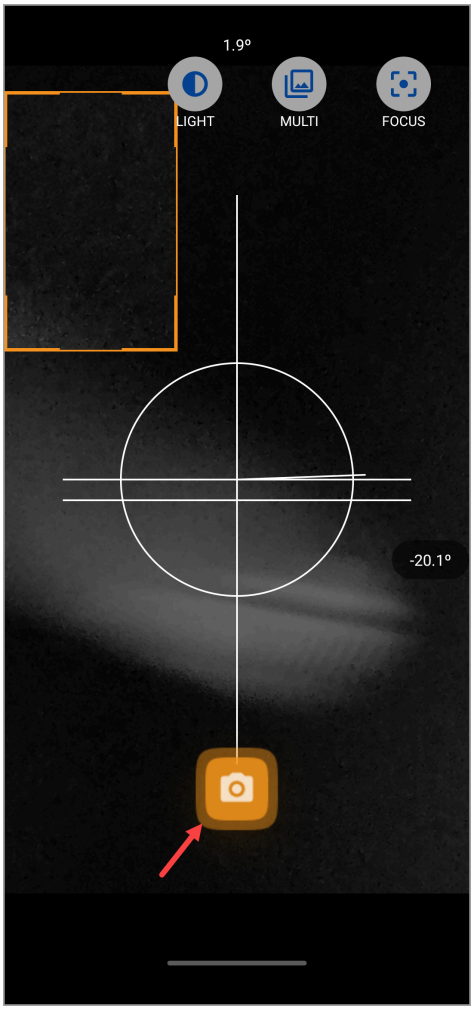
Tips and Tricks

For best results, place the phone as close to the droplet as possible while keeping the droplet in focus and the focus slider set to its maximum value.

Moreover, you can get the best contrast between the droplet and the background by adjusting the LED light on the base plate.

To better configure the image settings, capture a test droplet.

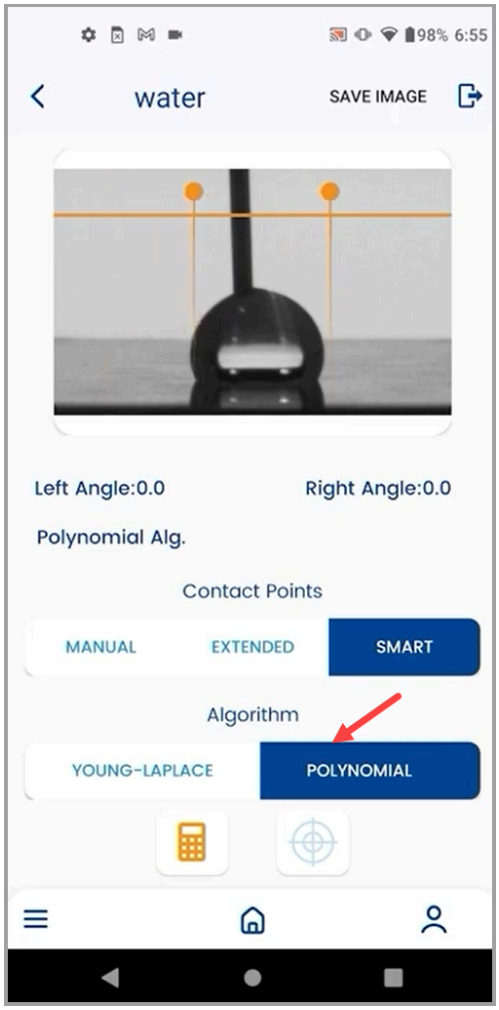
8. Once the required adjustments are made, tap the capture button. Doing so displays a preview of the captured image with the contact angle details.



9. Here, you can see the Contact Points heading with three options below it. They include Manual, Extended, and Smart. By default, the Smart contact points method is selected. This method only requires you to provide an estimate of the contact points at the baseline and right and left. The exact contact points are then auto-detected by the system.

Here, a useful tip to keep in mind is not mistaking the reflection of the droplet for the original droplet while capturing the baseline.

10. The default algorithm for calculation is the Polynomial algorithm.

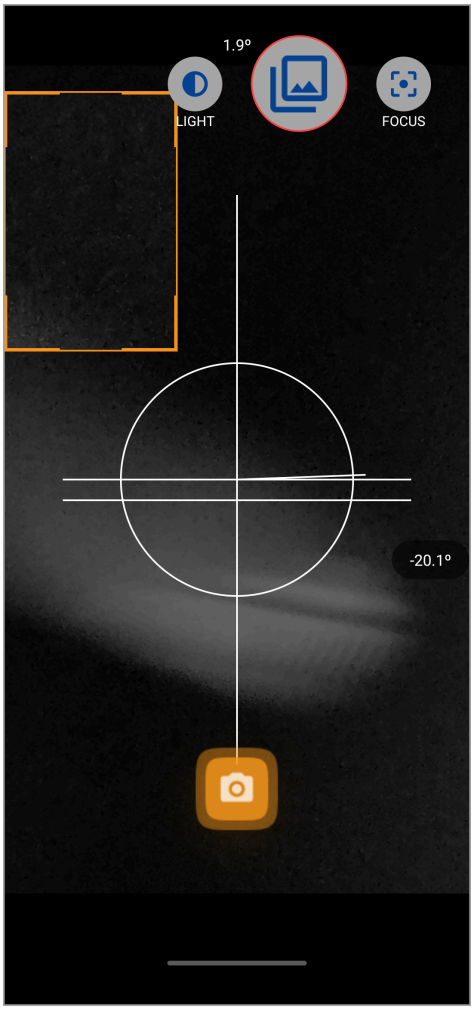


11. Once the required adjustments are made, tap the calculate button.

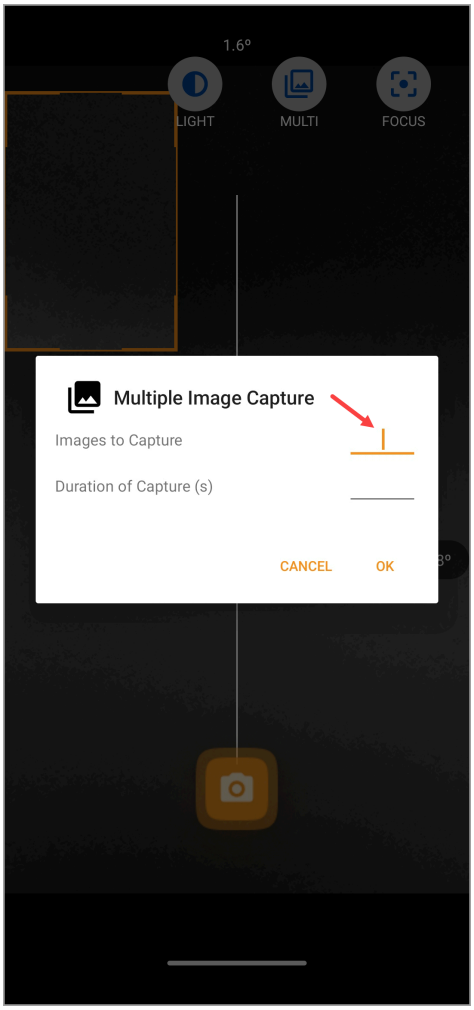
12. The Young Laplace method has already been explained in detail in the [How to Calibrate the Instrument?] article.

How to Use Multi Capture for Dynamic Contact Angle Measurement?

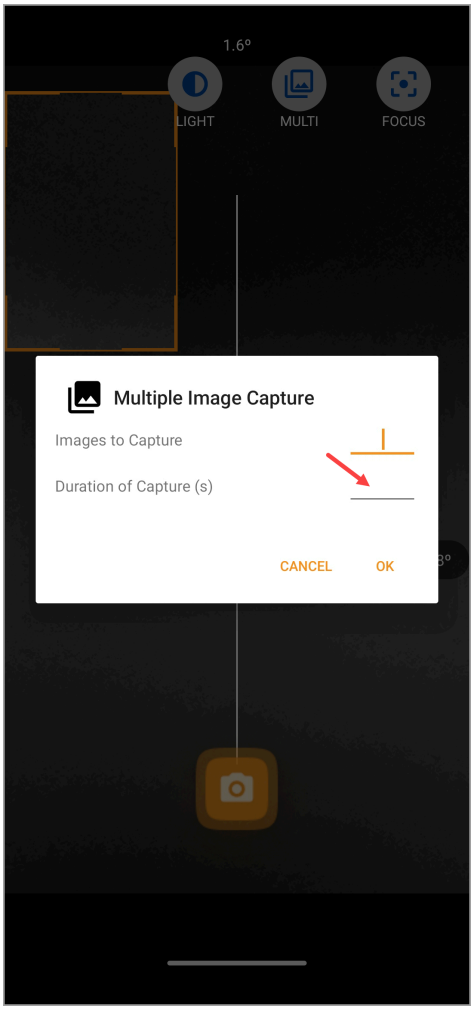
1. As the camera opens, tap the MULTI icon located at the top-right corner of the screen.



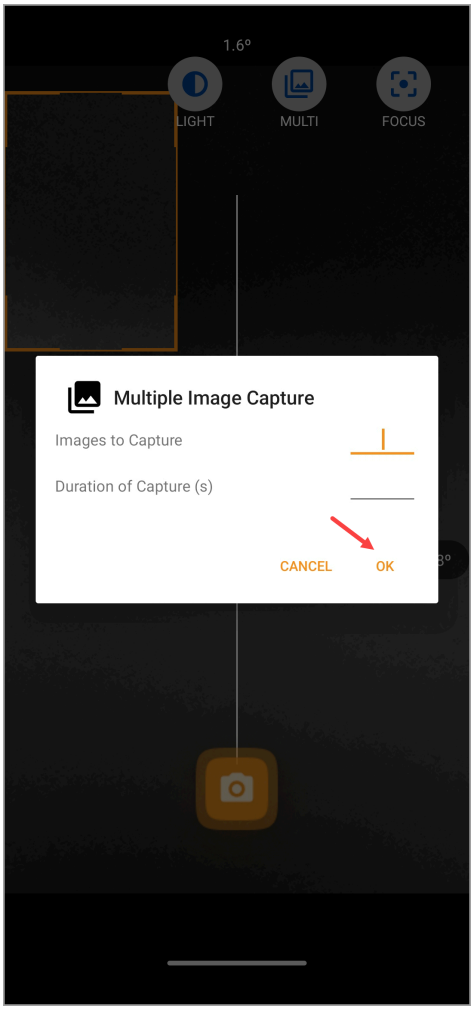
2. As a result, the Multiple Image Capture popup opens. Here, use the Images to Capture field to define the number of images you want to capture.



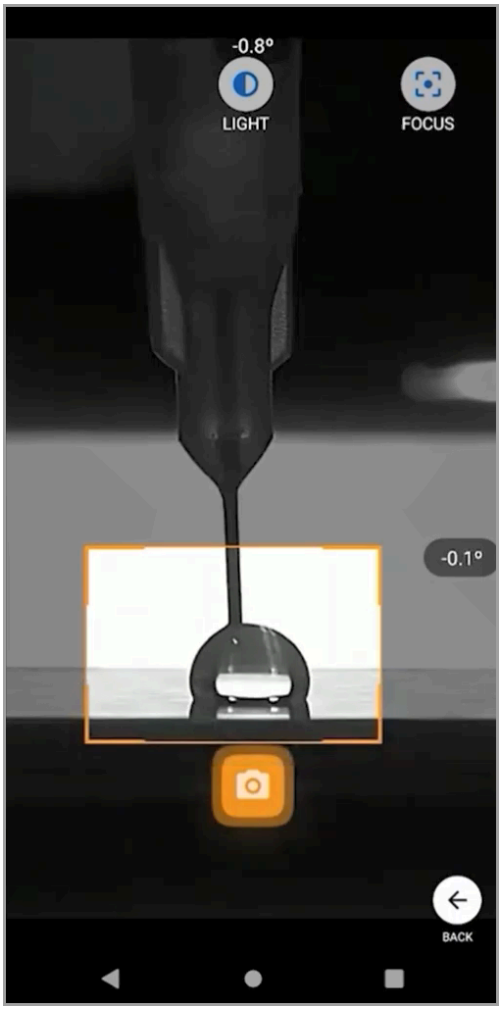
3. Enter the duration for capture(s) using the Duration of Capture(s) field.



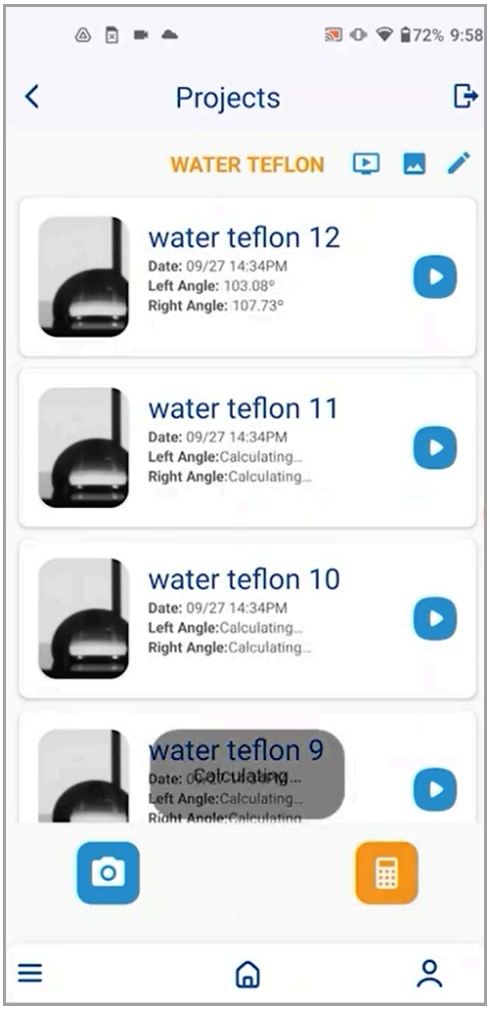
4. Once the required information is filled in, tap the OK button.



5. Once this is done, tap the Capture button and start creating the droplet.



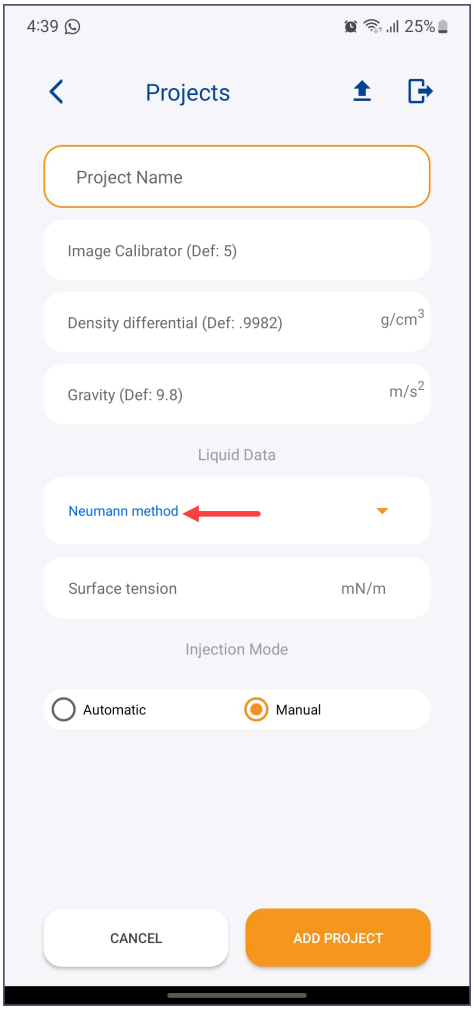
6. Once captured, go to one of the images in order to perform the entire calculation process including image calibration. In case you are using the Young Laplace method, tap the Calculate All button from the project screen so that all images captured within the specified duration can be processed.



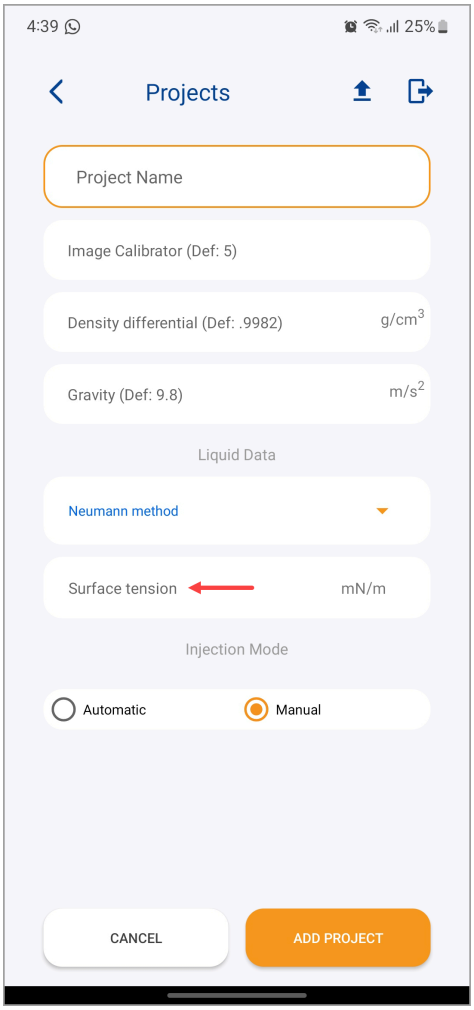
7. After you have completed calculation on a series of images, the rest of the images can be automatically calculated from the project screen.

How does the Surface Free Energy Measurement Work?

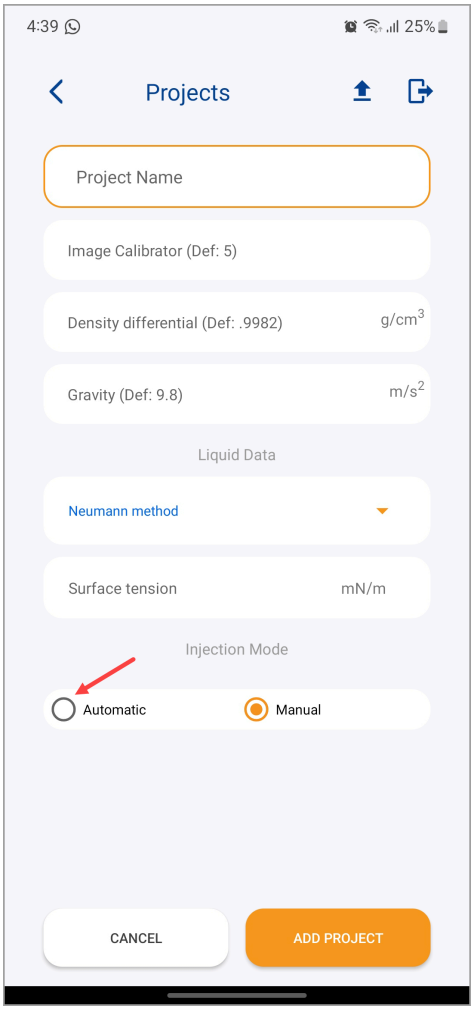
1. The process for measuring surface free energy is also similar to the contact angle measurement.
2. For surface free energy measurement, there are 3 most widely used methods. They include the Neumann method, Fowkes method, and the Oss and Good method.
3. The selection of the method depends on the type of surface you are using in the experiment. It is recommended to study the literature related to the surface under consideration before you select the measurement method. For our demo, we will be using the Neumann method.



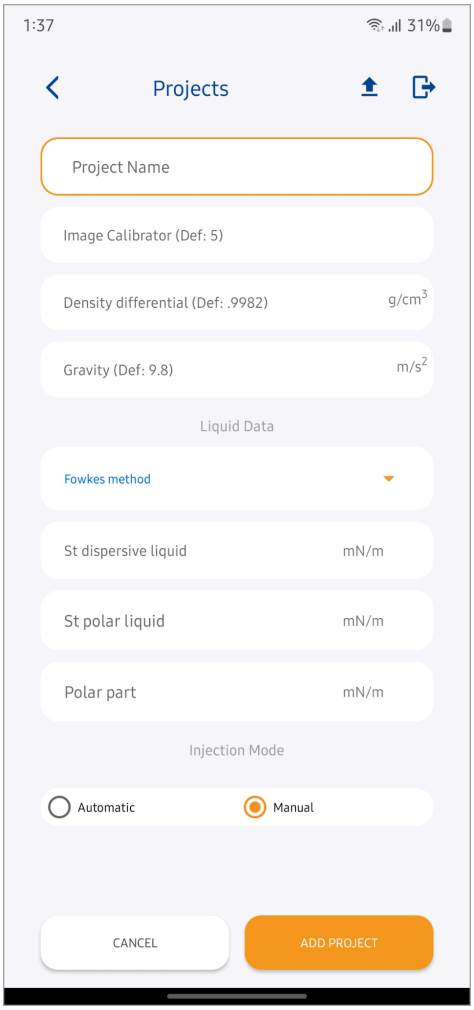
4. Next up is the Surface Tension field. Use this field to record the surface tension of the material.



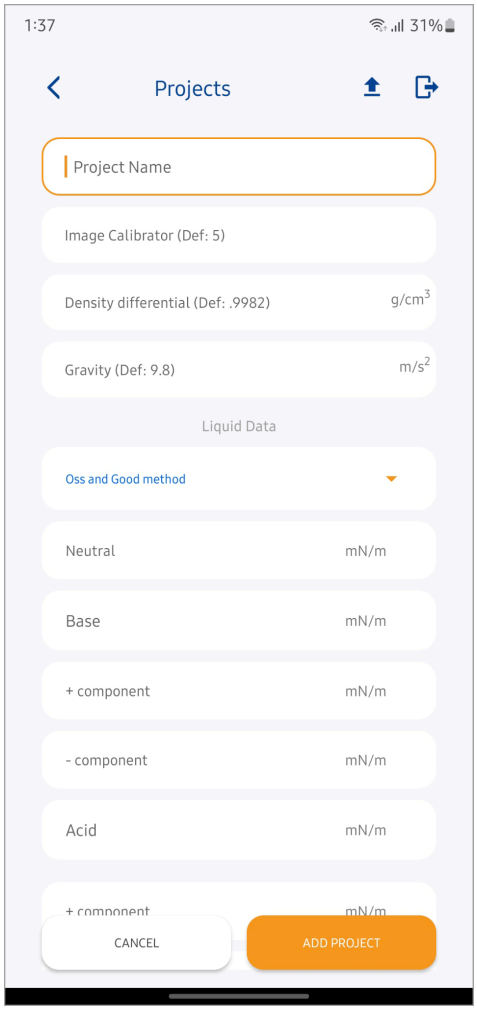
5. Towards the last is the Injection Mode. By default, it is set to Manual. To choose automatic, tap the Automatic radio button.



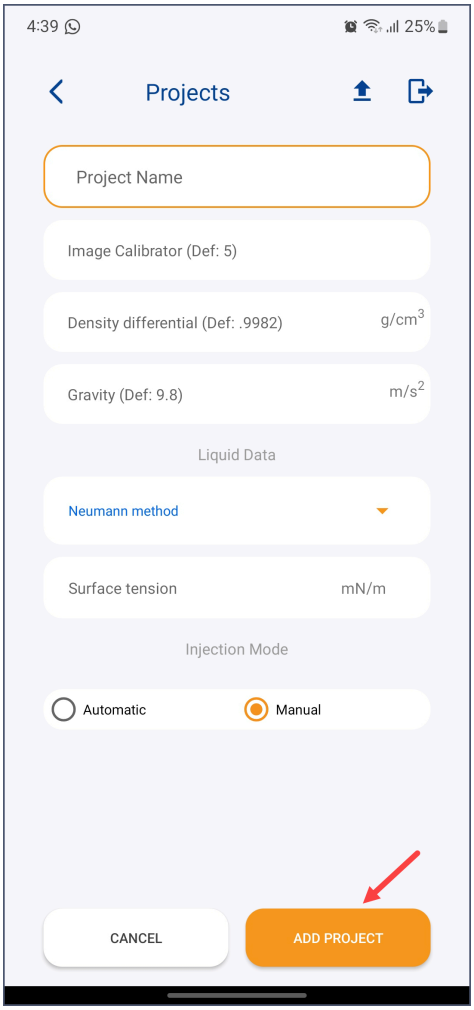
6. For the Fowkes method, additional fields are displayed.

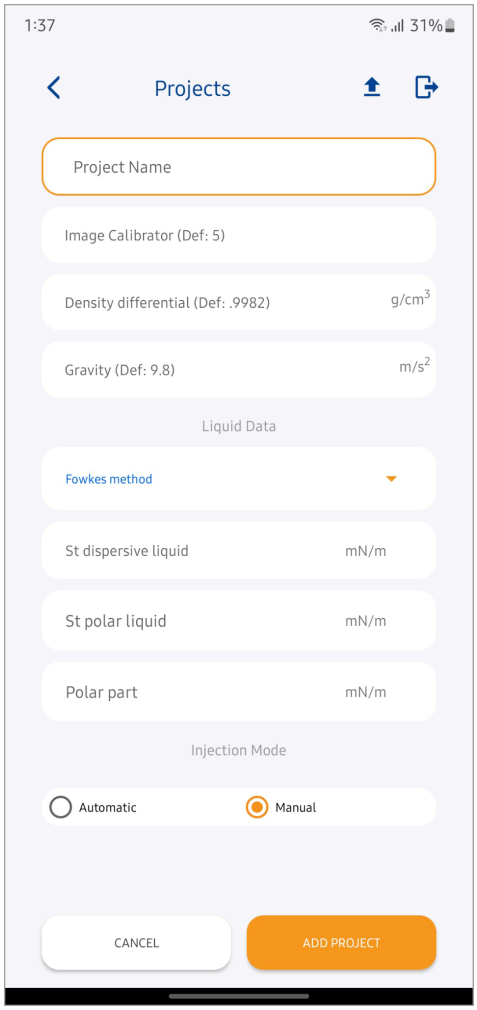


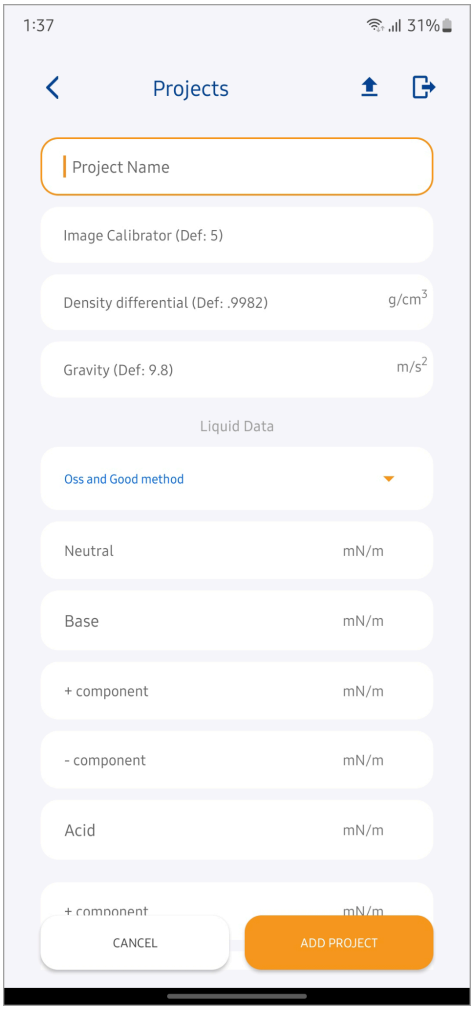
7. You can see additional fields while selecting the Oss and Good method as well.



8. Once the selections are made, click the Add Project button. This creates the project.

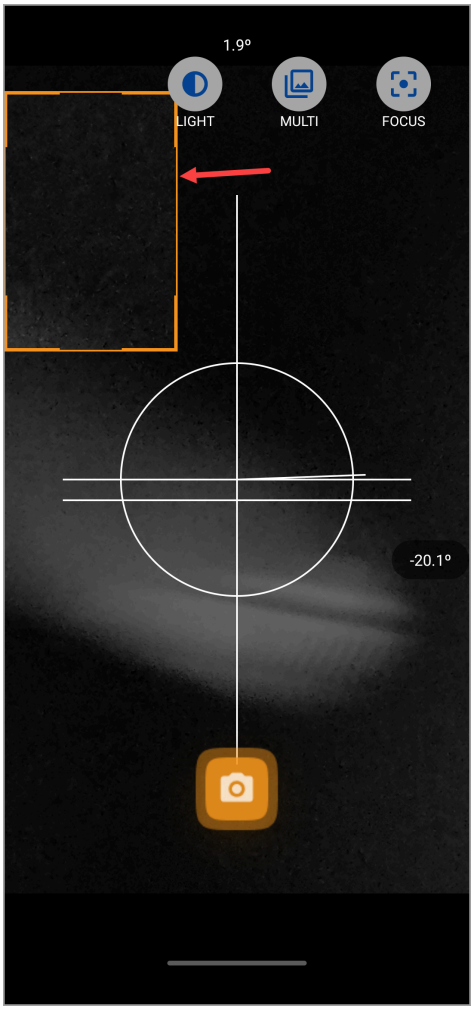

4:39
25%
Projects
Project Name
Image Calibrator (Def: 5)
Density differential (Def: .9982)
g/cm3
Gravity (Def: 9.8)
m/s2
Liquid Data
Neumann method
Surface tension
mN/m
Injection Mode
Automatic
Manual
CANCEL
ADD PROJECT


1:37
31%
Projects
Project Name
Image Calibrator (Def: 5)
Density differential (Def: .9982)
g/cm3
Gravity (Def: 9.8)
m/s2
Liquid Data
Fowkes method
St dispersive liquid
mN/m
St polar liquid
mN/m
Polar part
mN/m
Injection Mode
Automatic
Manual
CANCEL
ADD PROJECT

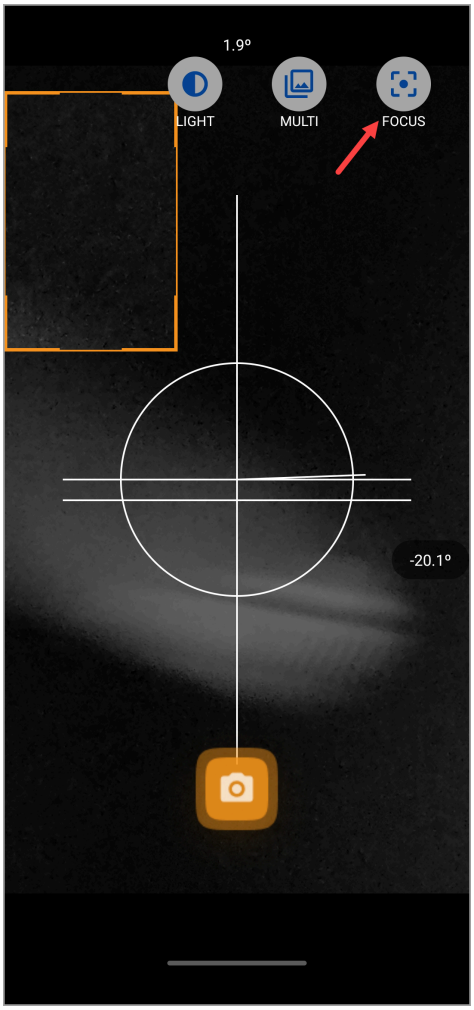


9. Once the project is created, tap the project name. This displays the details of the selected project.
10. From the screen that follows, tap the capture image button located at the bottom-left corner.

11. As the camera opens, adjust the distance from the needle in a way that you do not lose focus.
12. Drag and adjust the orange box to select the area you want to capture.



13. To ease it out, tap the Focus button atop the screen so that you can adjust the focus slider in order to obtain the best results. This is because the best practice is to be as close to the droplet as possible while ensuring that the focus is not lost.



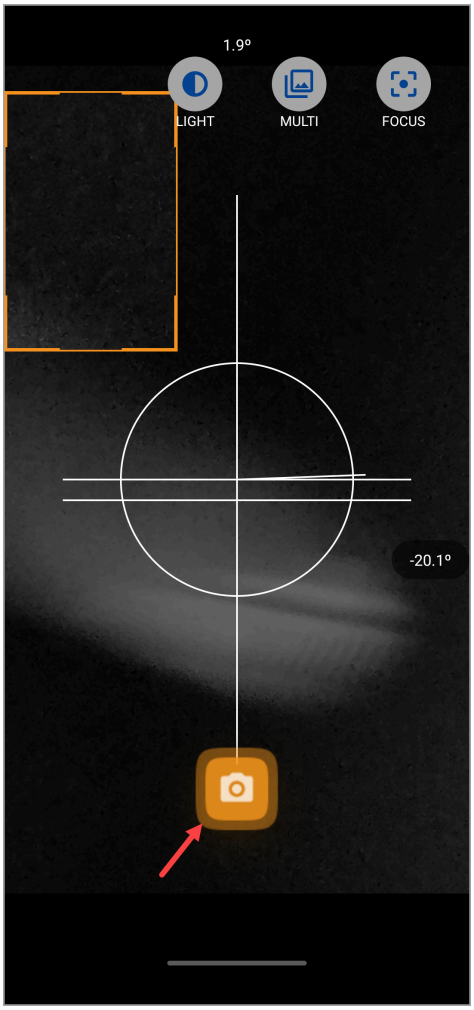
Tips and Tricks

For best results, set the focus slider as close to the maximum value as possible.

Moreover, you can get the best contrast between the droplet and the background by adjusting the LED light on the base plate.

To better configure the image settings, capture a droplet for reference.

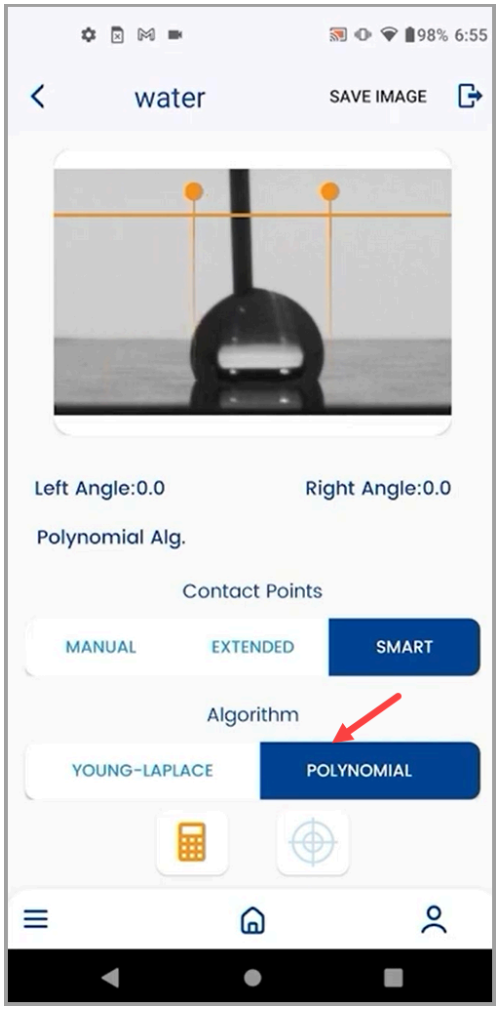
14. Once the required adjustments are made, tap the capture button. Doing so displays a preview of the captured image with the contact angle details.



15. Here, you can see the Contact Points heading with three options below it. They include Manual, Extended, and Smart. By default, the Smart contact points method is selected. This method only requires you to provide an estimate of the contact points at the baseline and right and left. The exact contact points are then auto-detected by the system.

Here, a useful tip to keep in mind is not mistaking the reflection of the droplet for the original droplet while capturing the baseline contact points.

16. Moreover, the default algorithm for calculation is the Polynomial algorithm.

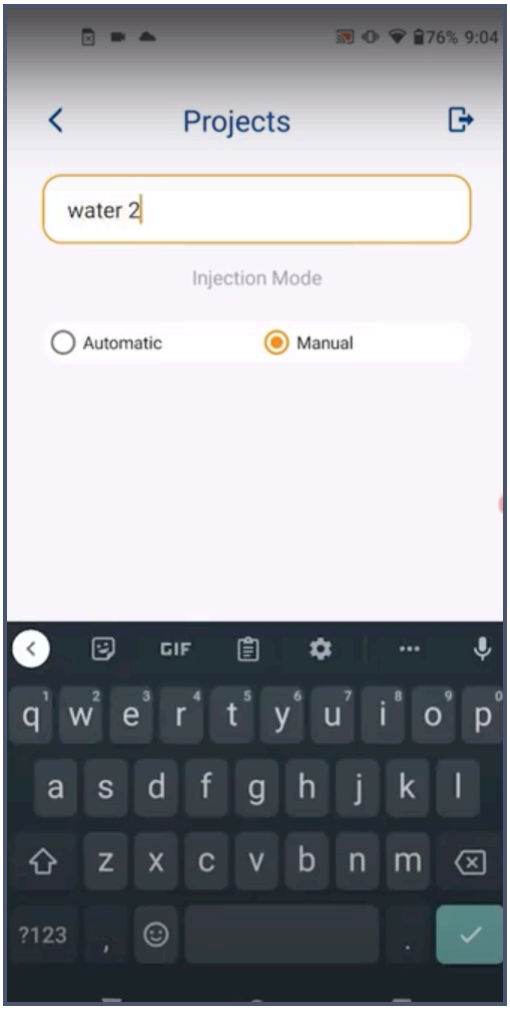


17. Once the required adjustments are made, tap the calculate button.

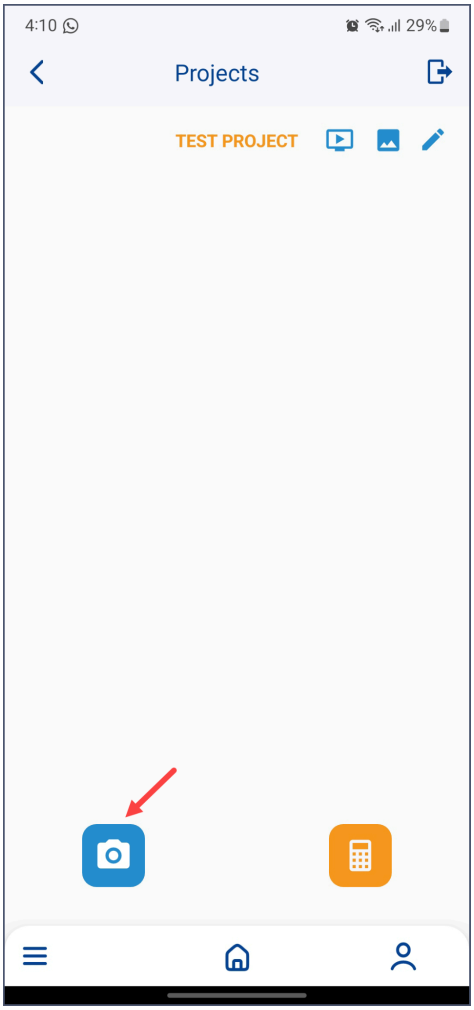
18. The Young Laplace method has already been explained in detail in the How to Calibrate the Instrument? article.

How does the Sliding Angle Measurement Work?

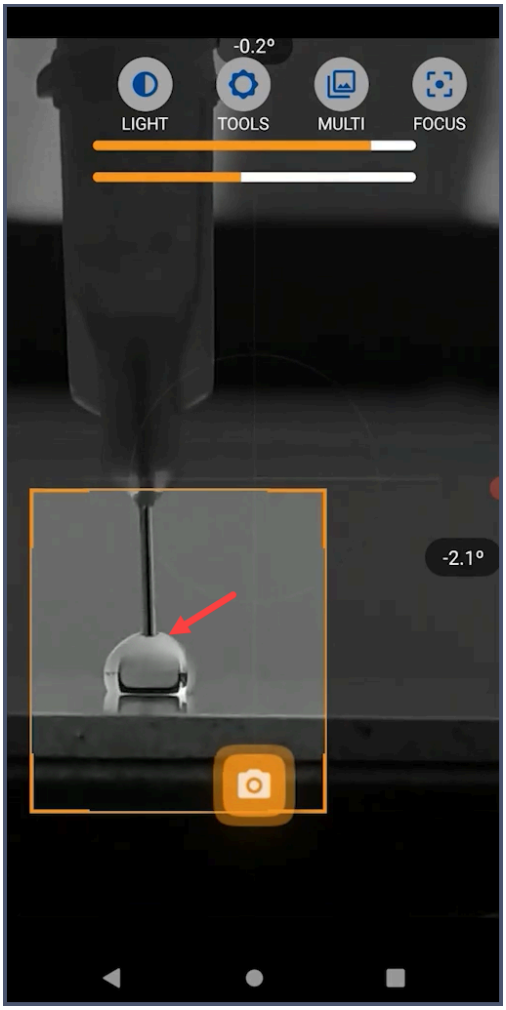
1. Sliding angle measurement is best-suited when there is a need to slide the stage and capture multiple images as the droplet slides on the surface.
2. Like the other types of measurement, the process for project creation is similar.



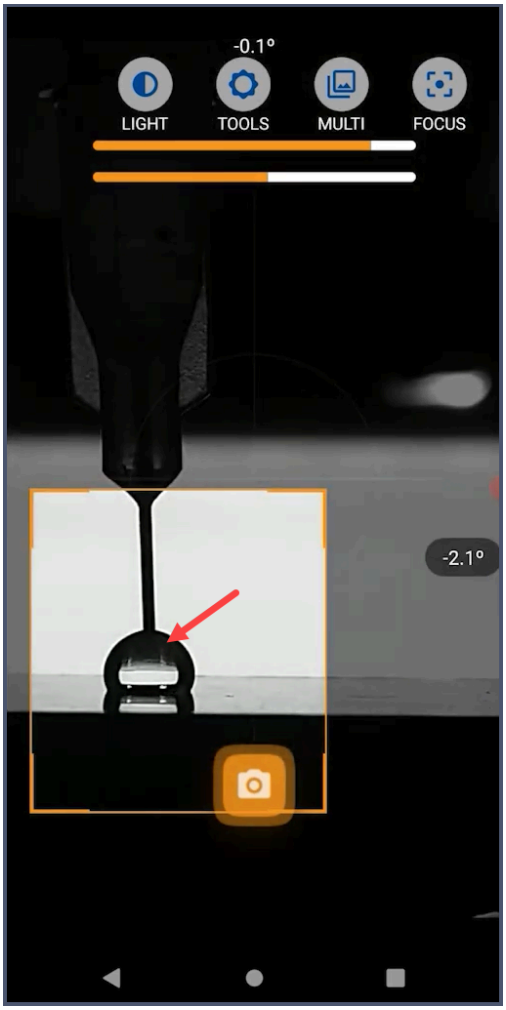
3. Once a project is created, select the project and tap the blue image capture button located at the bottom-left corner of the screen.



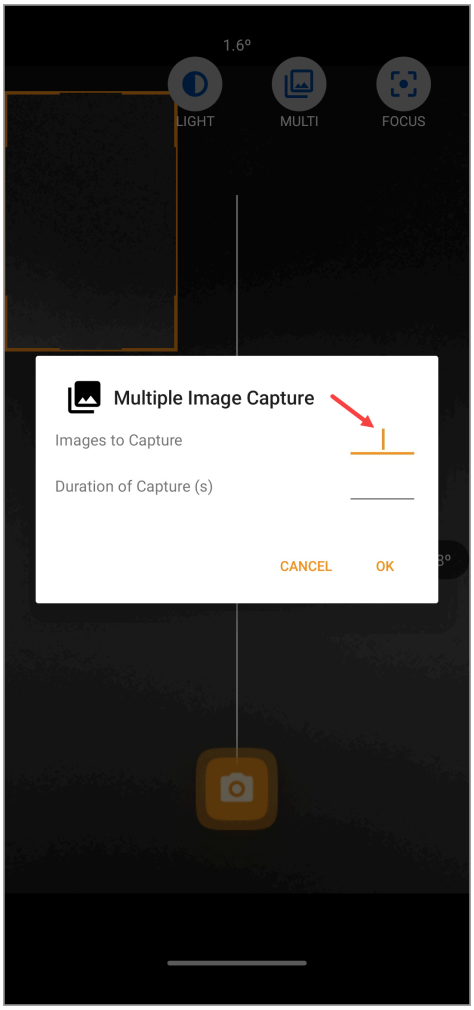
4. Doing so opens the camera for you to capture the distance from the needle.
5. Here, adjust the orange box to define the area of interest.



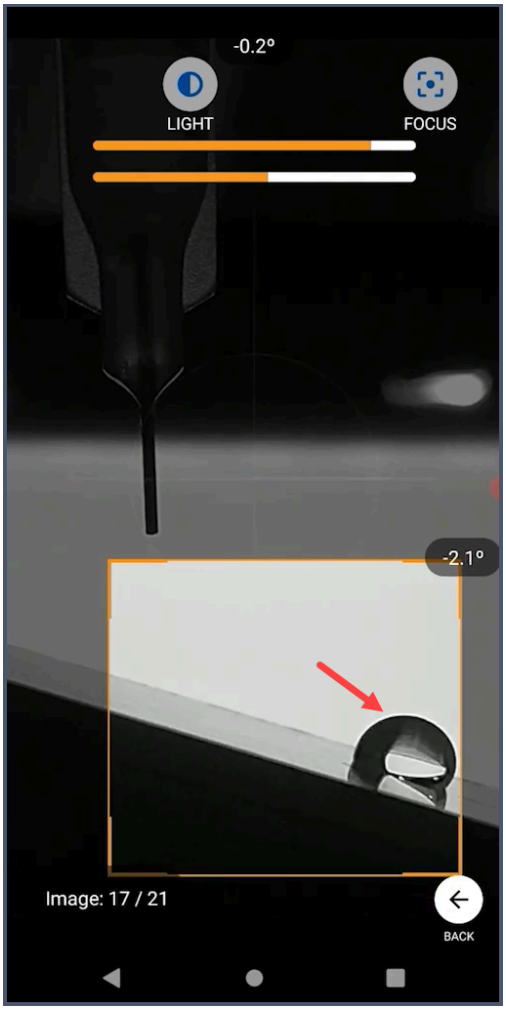
6. Once the area is defined, use the focus slider to focus on the droplet.
7. After that, adjust the LED light to ensure the best possible contrast between the droplet and image background is achieved.



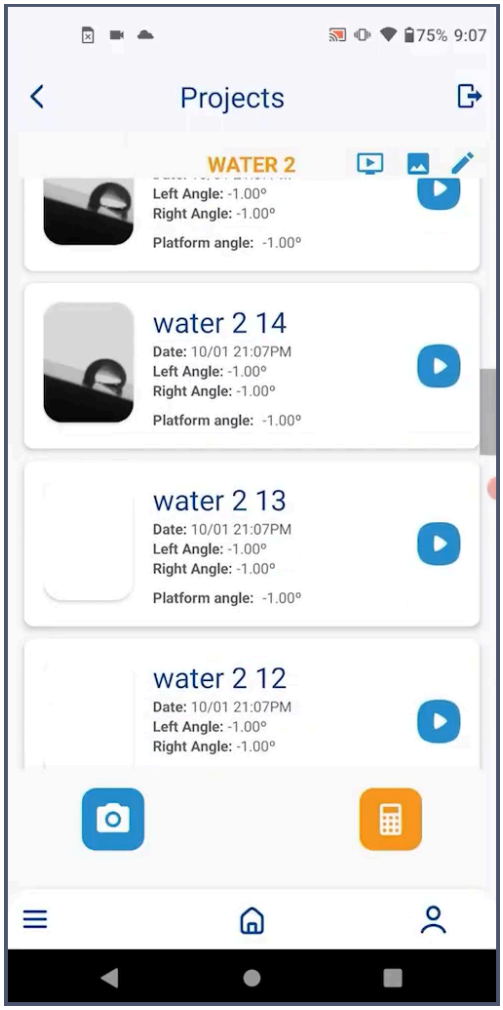
8. For this type of measurement, it is recommended to use the multi-capture feature when the droplet is close to the roll-off angle. You can learn how it works by reading How to Capture Multiple Images? article.



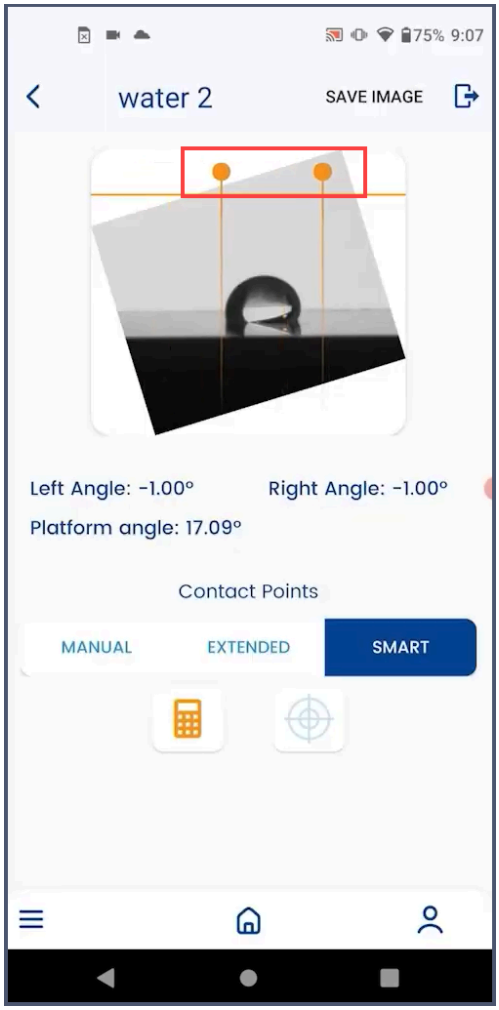
9. Upon doing that, start tilting the stage to get the sliding angle. Hit the capture button to capture the images.
10. Continue tilting the stage until the droplet starts sliding off.



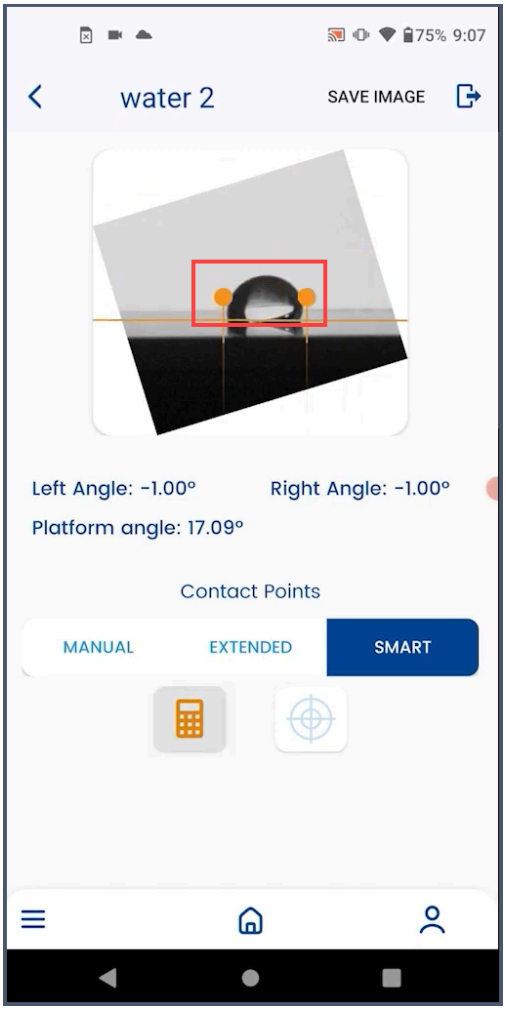
11. As the images are captured, tap one of the images to take measurement. Doing so opens the measurement details screen.



12. For sliding angle measurement, you only need to provide an estimation of baseline along with the right and left contact points.

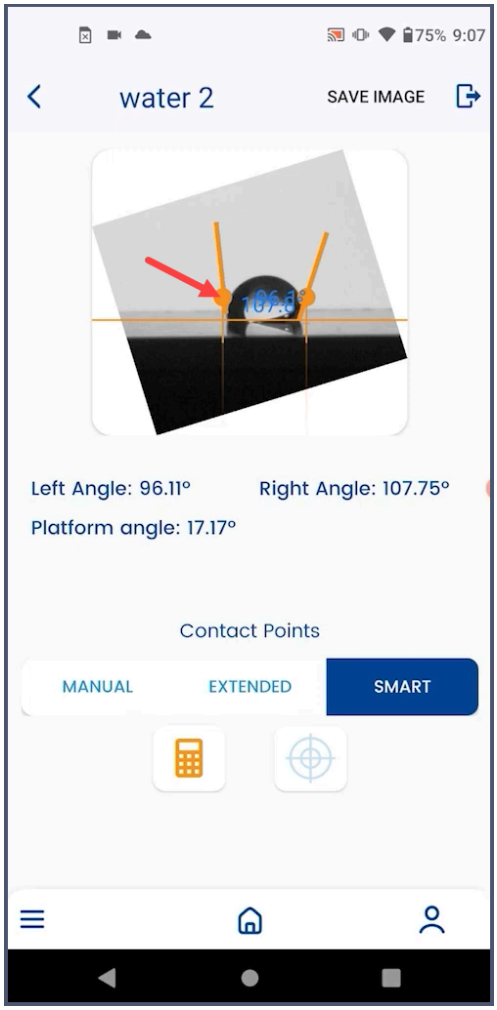


13. The exact contact points are then automatically detected by the system.

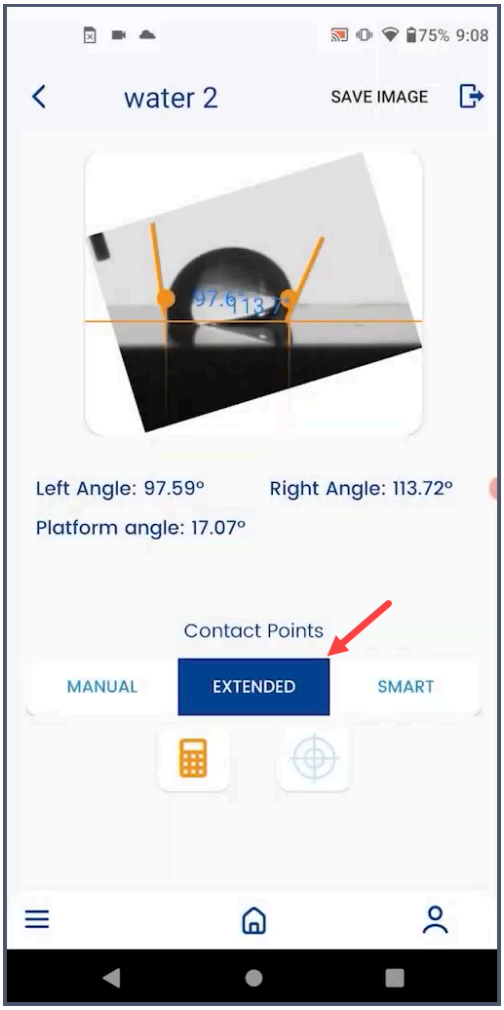


14. To complete the measurement process, tap the calculate button.

15. In some cases, a base point is not measured at the baseline. To address this issue, you can adjust the brightness during image capture. For instance, in the image below, the left contact point is not measured at the baseline.



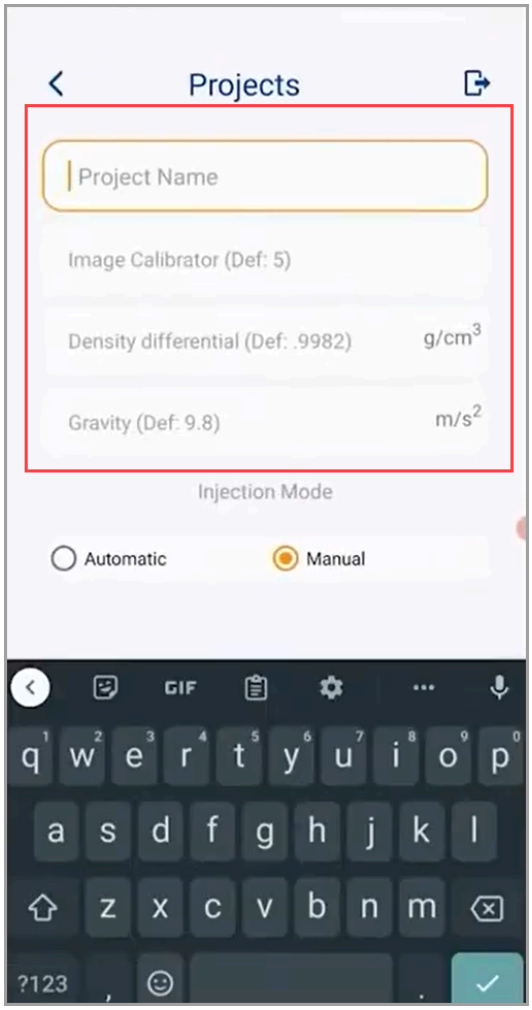
16. Alternatively, you can also switch to manual or extended contact points methods.
17. The Extended contact point method uses the droplet profile in order to locate the exact contact angle.



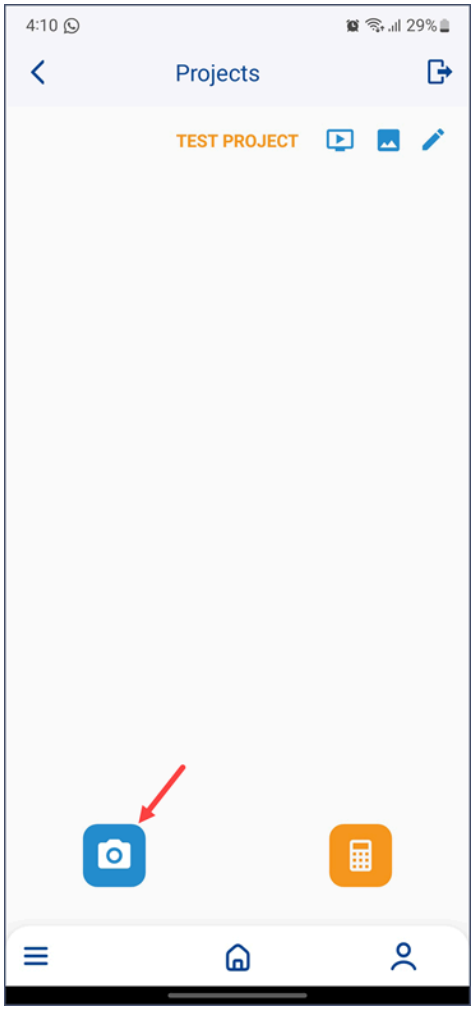
18. Moreover, you can also use a pre-tilted stage for sliding angle measurement. However, you need to adjust the orange cropping window to the area around the droplet in this case.

How does the Surface Tension Measurement Work?

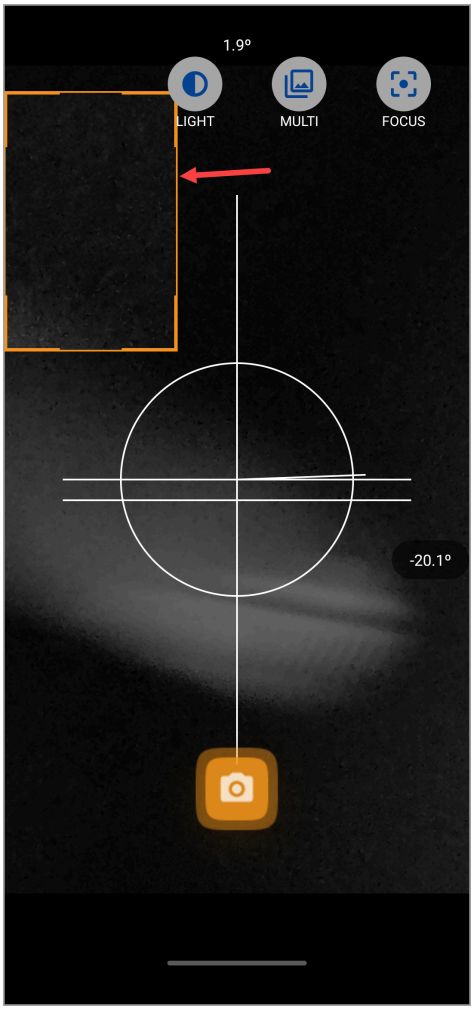
1. The surface tension measurement process is also similar to the ones explained earlier.
2. Starting off, you need to create a new project while filling in the project name, image calibrator, density differential, and acceleration of gravity explained in the “which calibrations are needed for measurement?” article.



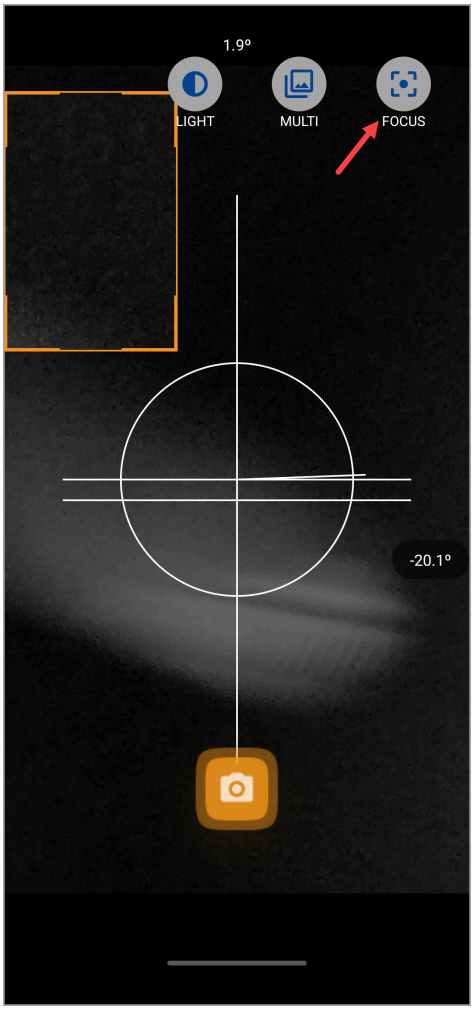
3. Once the project is created, tap the image capture button located at the bottom-left corner of the screen.



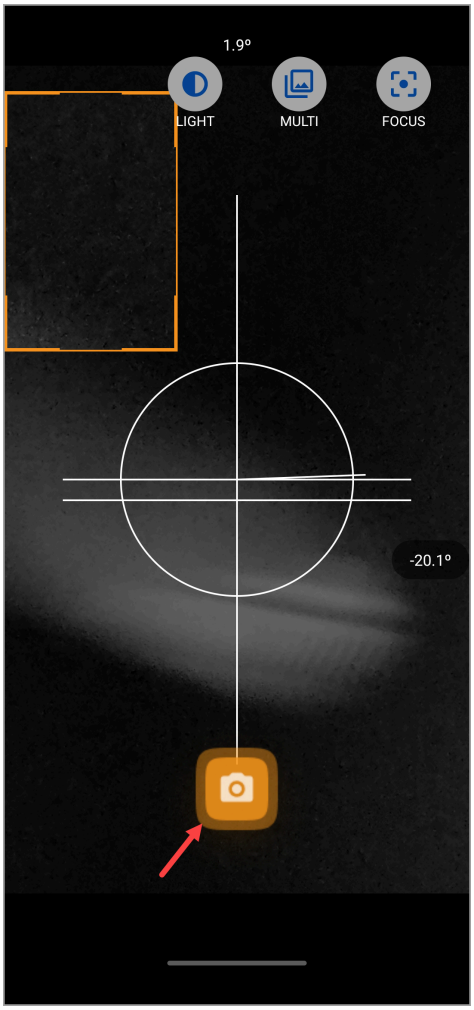
4. As the camera opens, adjust the distance from the needle in a way that you do not lose focus.
5. Drag and adjust the orange box to select the area you want to capture.



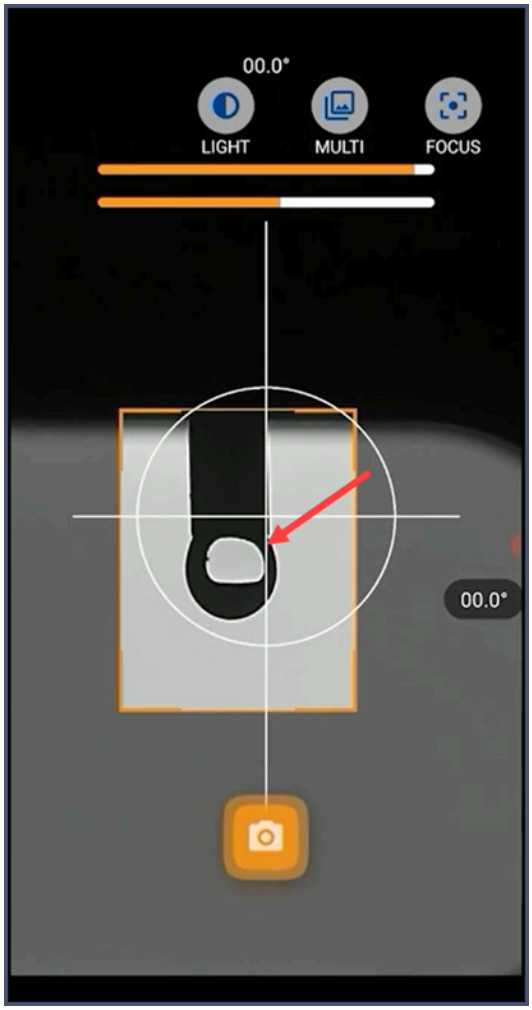
6. To ease it out, tap the Focus button atop the screen so that you can adjust the focus slider in order to obtain the best results. This is because the best practice is to be as close to the droplet as possible while ensuring that the focus is not lost.



7. Once the required adjustments are made, tap the capture button. Doing so displays a preview of the captured image with the contact angle details.



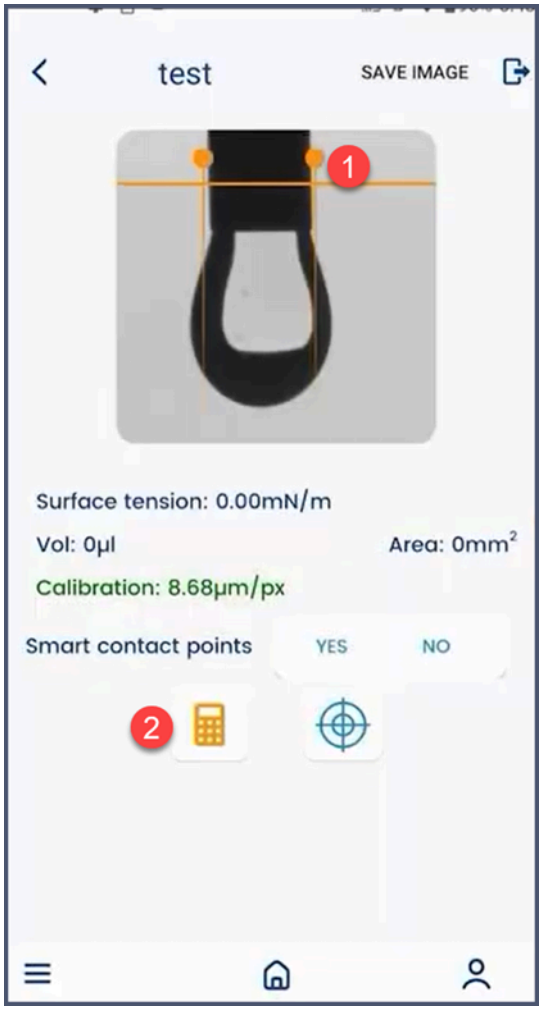
8. However, it is recommended to generate a tear-shaped droplet large enough that it is about to detach from the needle so that the shape deforms sufficiently by gravity for this type of measurement.



9. Once the image is captured, the measurement details screen is displayed.

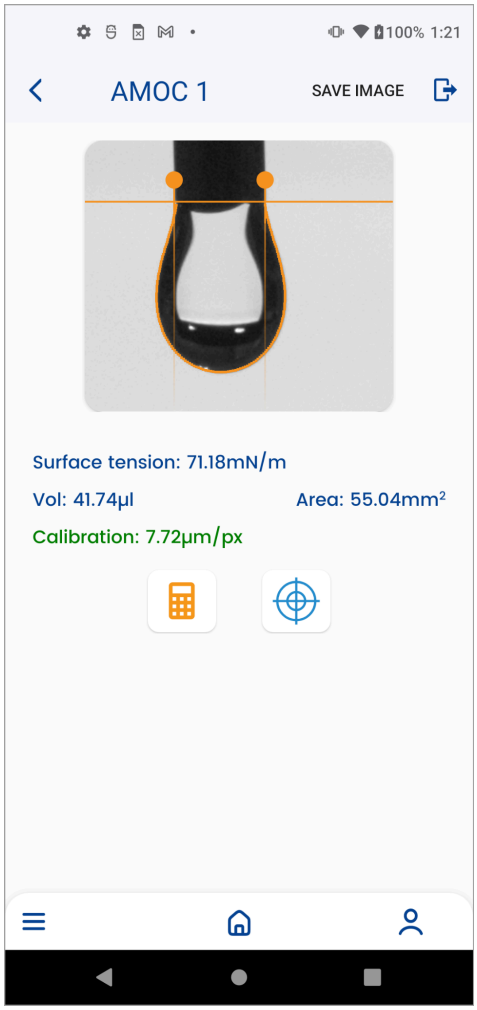
10. Here, adjust the orange vertical bar to the position at which the droplet meets the needle.

11. Adjust both points of the vertical bar to the sides of the droplet. Once that is done, tap the Calculate button.



12. Once calculated, you get the surface tension, volume, and the area of the droplet.

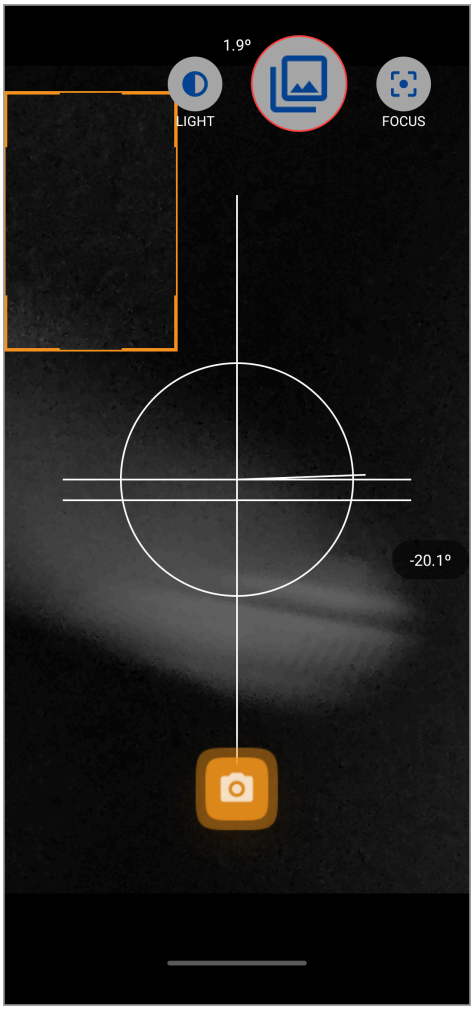
13. As explained earlier, the color in which the calibration value is displayed depicts whether the value is correct or incorrect (green indicates correct whereas yellow or red indicates incorrect).



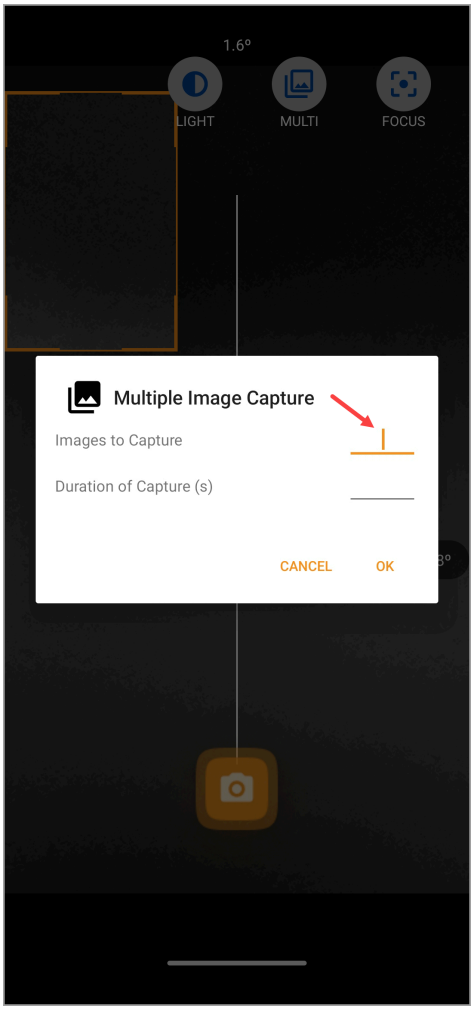
A processed image for reference.

How to Use Multi-Capture Feature for Dynamic Surface Tension Measurement?

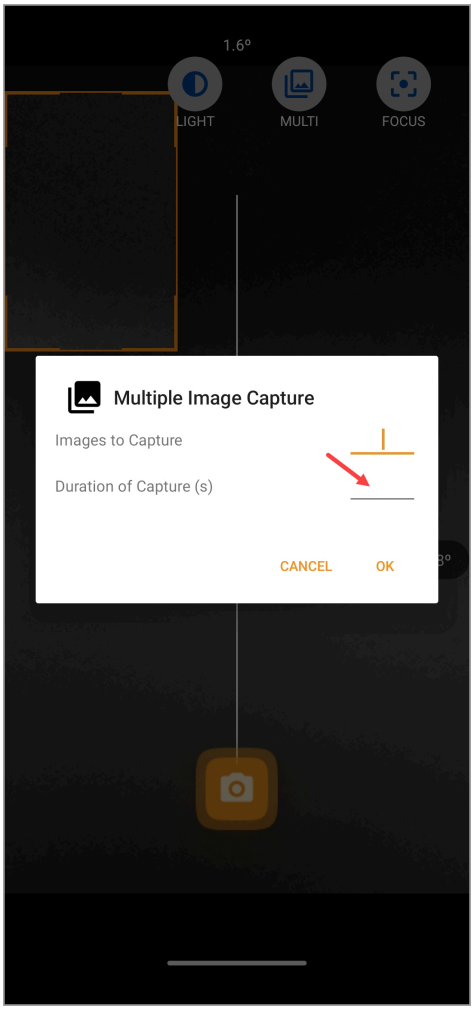
1. As the camera opens, tap the MULTI icon located at the top-right corner of the screen.



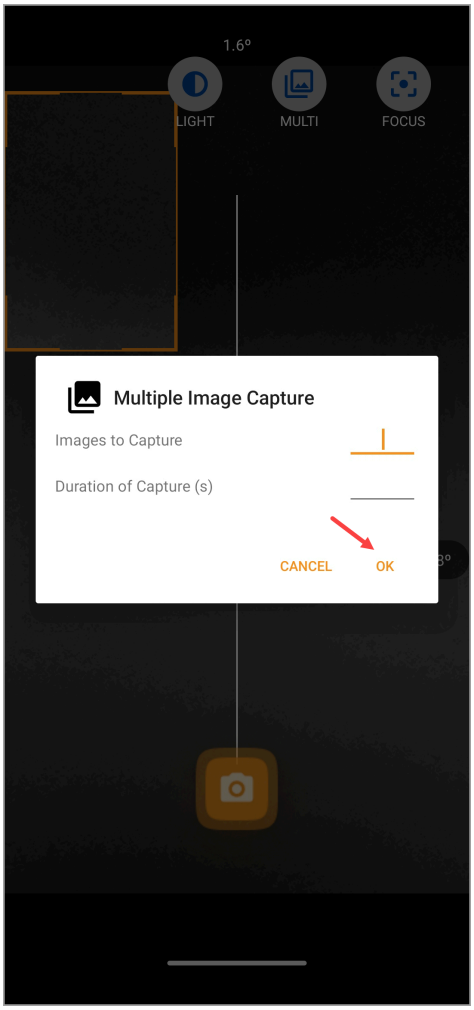
2. As a result, the Multiple Image Capture popup opens. Here, use the Images to Capture field to define the number of images you want to capture.



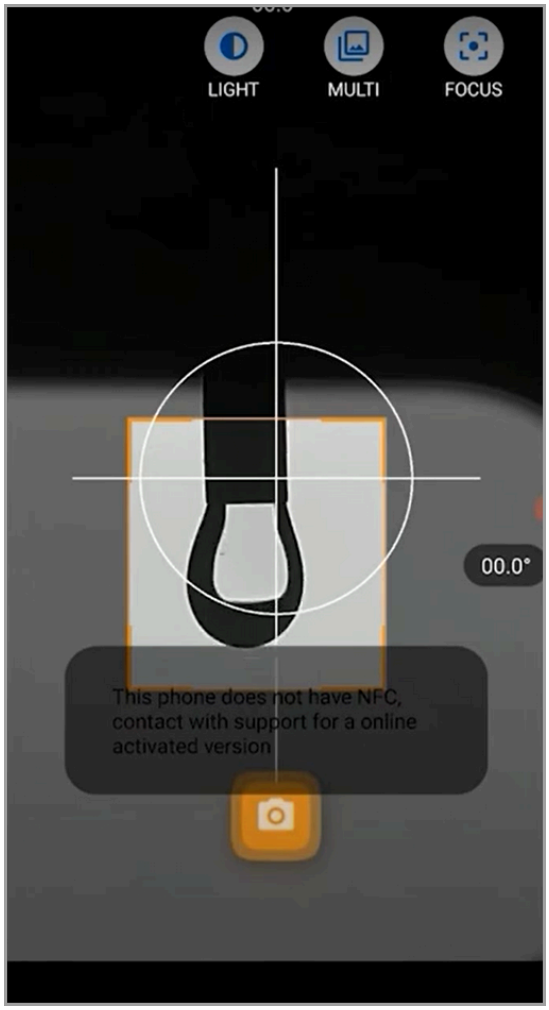
3. Enter the duration for capture(s) using the Duration of Capture(s) field.



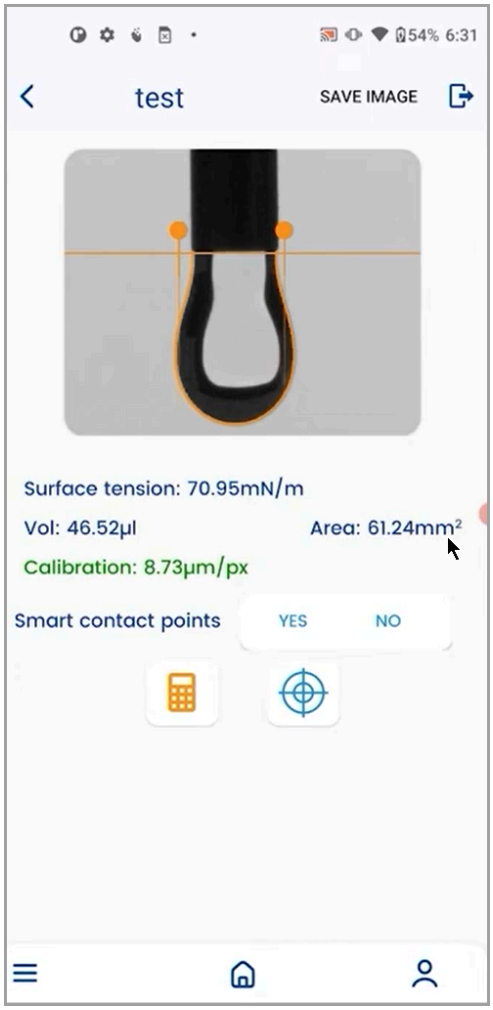
4. Once the required information is filled in, tap the OK button.



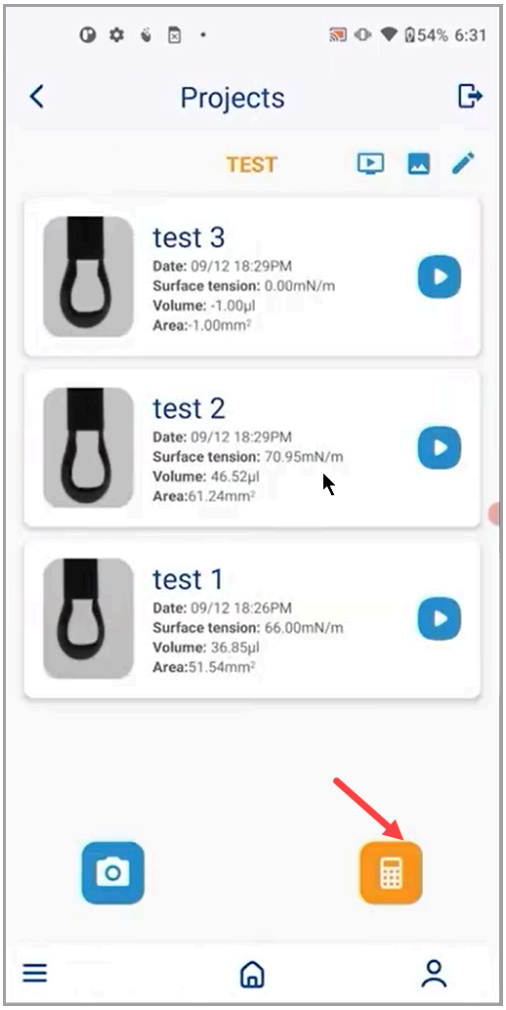
5. Once this is done, tap the Capture button to start capturing the droplet. Generate the droplet slowly and capture right before the image leaves the needle.



6. Go to one of the captured images in order to perform the calculation process including calibrations.



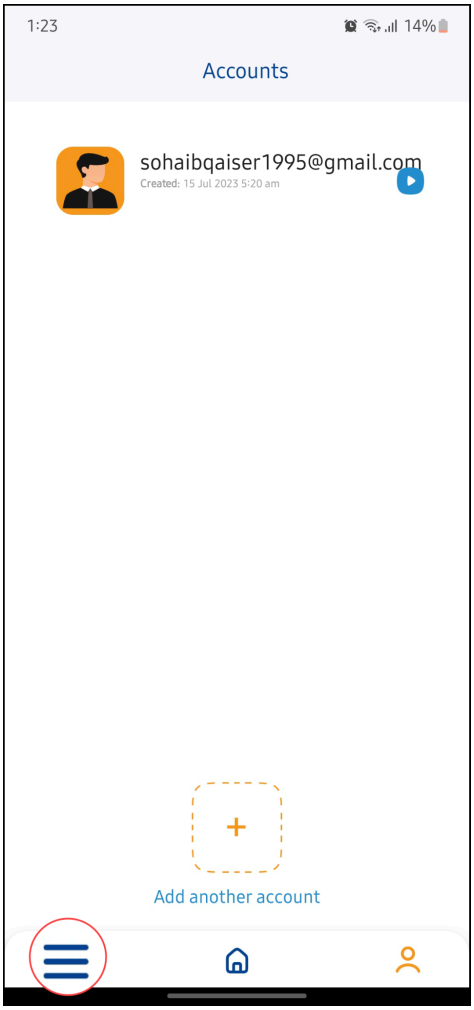
7. After that, go back to the Project screen and tap the Calculate All button. This processes all the images captured in the specified timeframe.



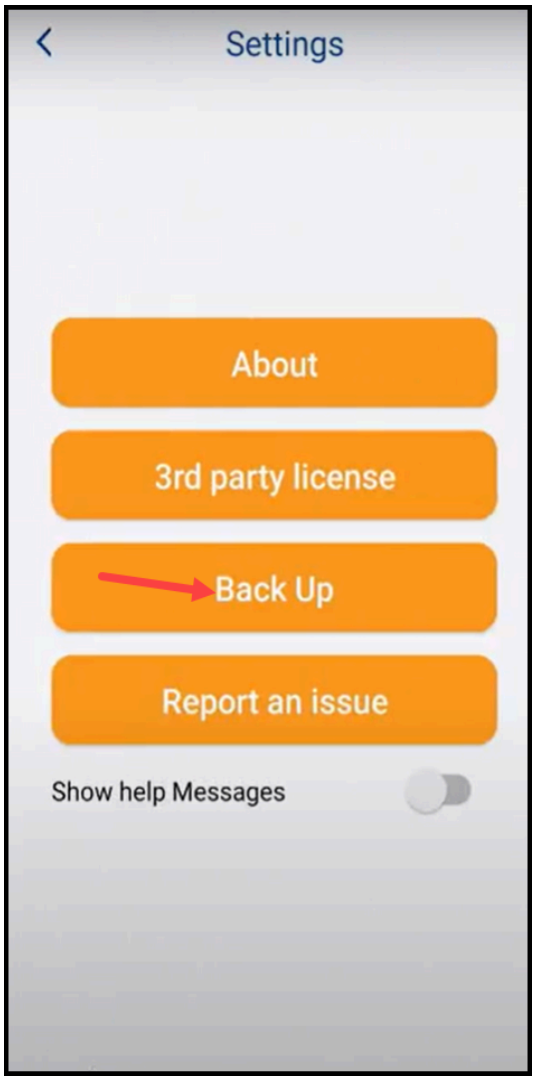
Data Management

How do I backup my Data?

1. Upon successful login, tap the three-line icon located at the bottom-left corner of the screen.



2. This takes you to a screen where a number of options are available. From these options, tap Backup. Doing so backs up your data.

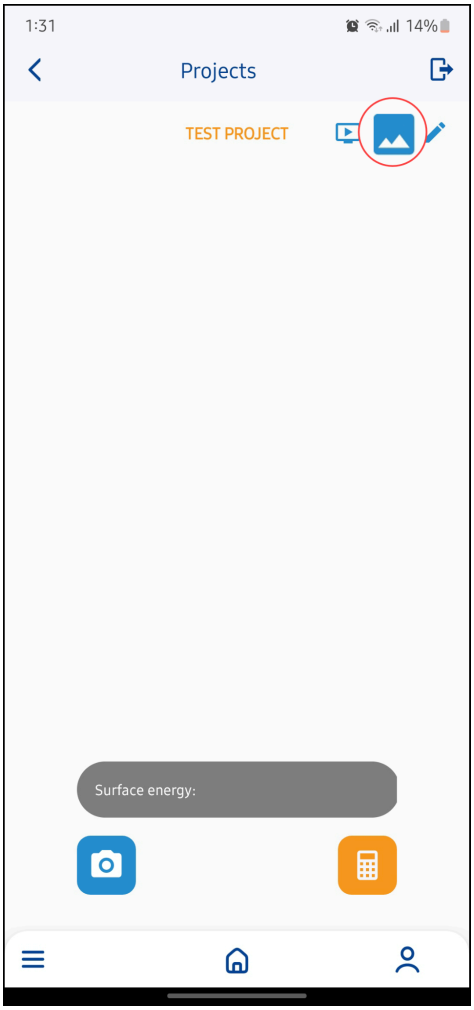


3. Once the backup process is complete, a notification is displayed to the user.

How do I import images?

1. Upon successful login, open a project by tapping the project name.

2. This opens the details for the selected project. Here, tap the image icon located at the top-right corner of the screen. Doing so opens the internal storage of your mobile device to select the image(s) you want to import.



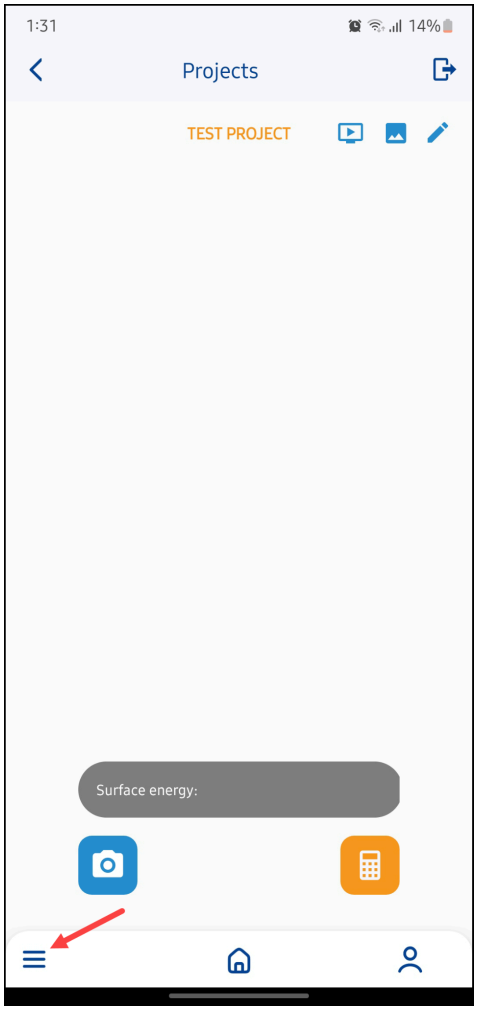
How do I export the processed images?

Exporting processed images requires choosing a cloud service for the images to be saved. Let us take a look at how that is done.

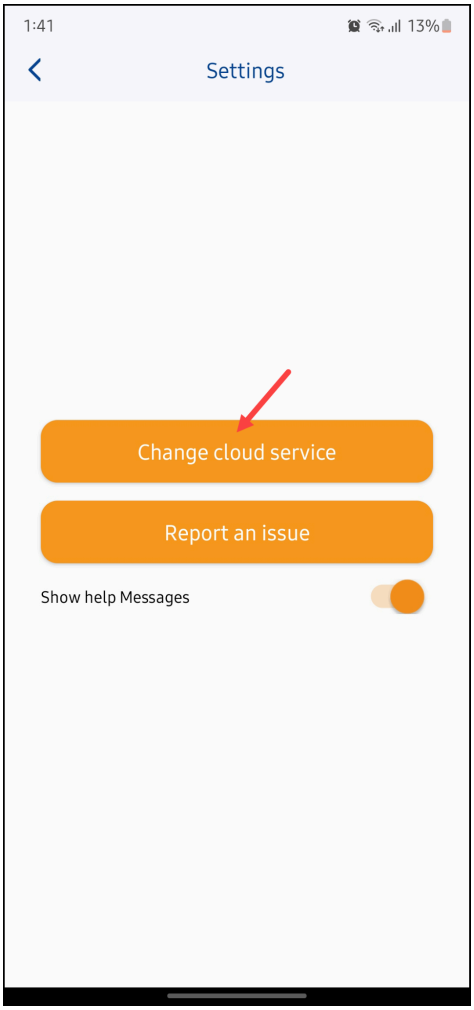
Step 1: Select Cloud Services

1. Upon successful login, open a project by tapping the project name.

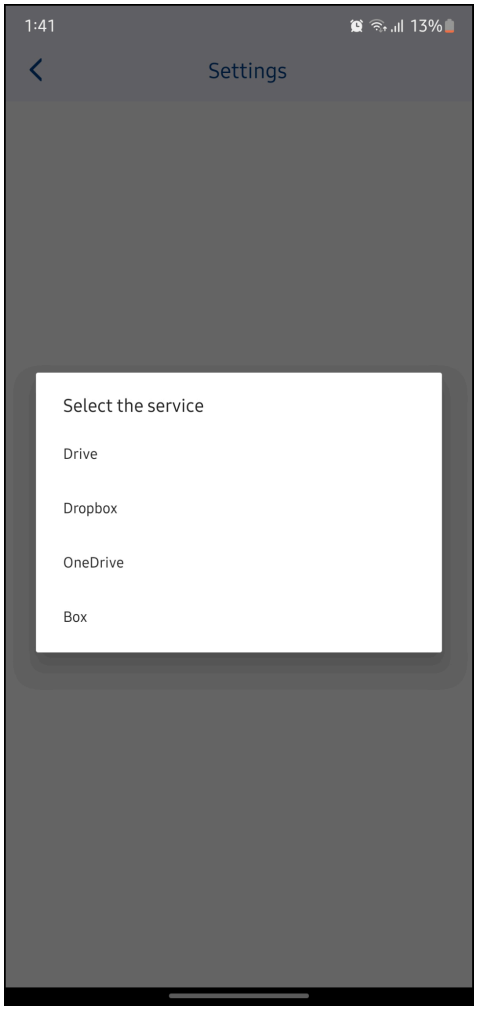
2. This opens the details for the selected project. From here, tap the three-line icon located at the bottom-left corner of the screen.



3. As a result, a number of options are displayed. Tap the Change Cloud Service button.

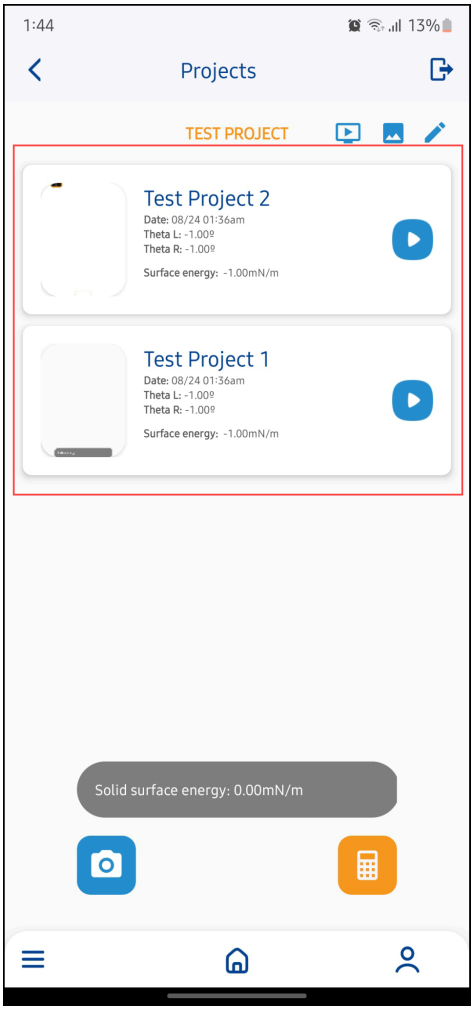


4. This opens a popup listing a number of available cloud services. Make the required selection using this popup.



Step 2: Save the Image(s)

5. Now go to the projects screen and select an image you have captured.

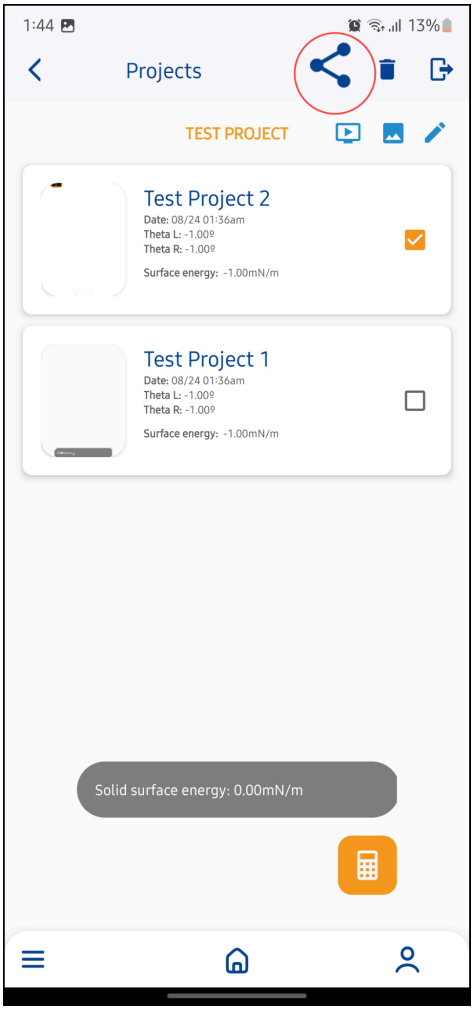


6. To save the selected image, click the SAVE IMAGE button located at the top-right corner of the screen.

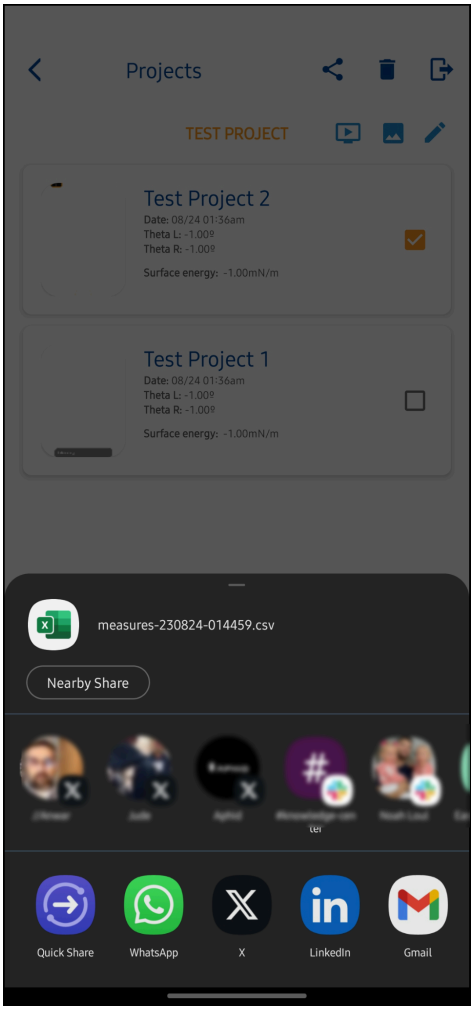
7. This opens the selected cloud service for the image to be saved.

Step 3: Export Processed Image(s)

8. Select the image you want to export the details for by long-tapping the image tile. This reveals a number of options at the top-right corner of the screen.
9. From these options, click the export icon.

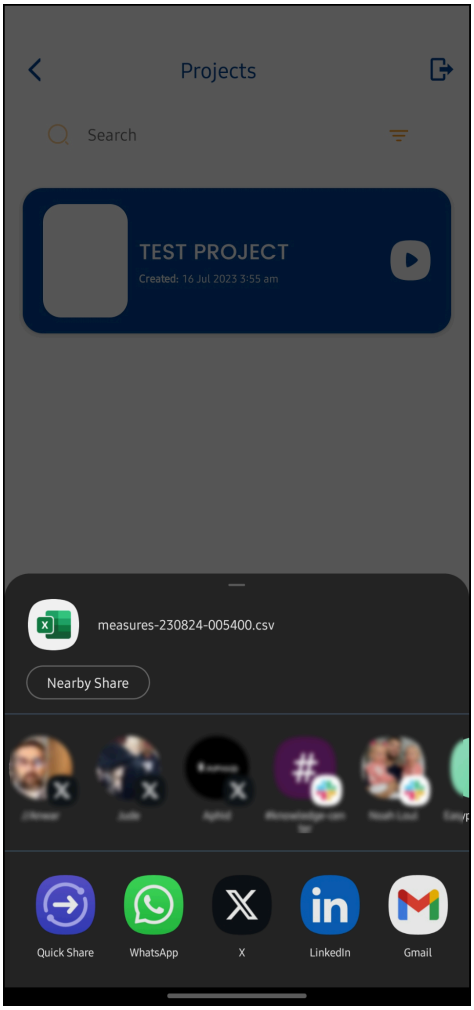


10. As a result, the app saves the calculations for the selected image in a .CSV file and asks you to choose the medium via which you want to export the image data. You can make the selection and export the selected image(s) via the chosen medium.



11. In case you want to do it for a complete project, long-tap the project tile from the Projects screen and tap the export icon from the options displayed at the top-right corner.

12. Choose the medium via which you want to export the project data.



How is my data Protected?

The account creation feature addresses the data protection. This is because when the user has an account to perform all the measurements, accidental deletion of data from other users is prevented.

Release Notes

Ability to Back Up App Data

With this enhancement, the user has the ability to back up all application data. This adds to the convenience of the user in case they lose access to their account.

How to Backup App Data?

1. Upon successful login, click the hamburger icon.
2. From the screen displayed, click Back Up. This starts a process to save the data.
3. Once the process completes, a notification shows the destination of the file.
4. Connect the phone to a computer to copy the data or use any cloud storage app to upload it to your cloud.

Ability to Calculate Inverted Drops

With this enhancement, the user has the ability to calculate inverted drops. Any new project with the gravity set to a negative value will rotate the image 180º for calculation using any of the included methods in the app.

Bluetooth Indicator on the Image Capture Screen

With this enhancement, a bluetooth indicator has been added to the image capture screen. This eases the identification of the bluetooth injector connection with the app. In case the injector is disconnected, the indicator turns red whereas it is displayed in green if the injector is connected.

Bug Resolution

In this release, the following bugs have been fixed:

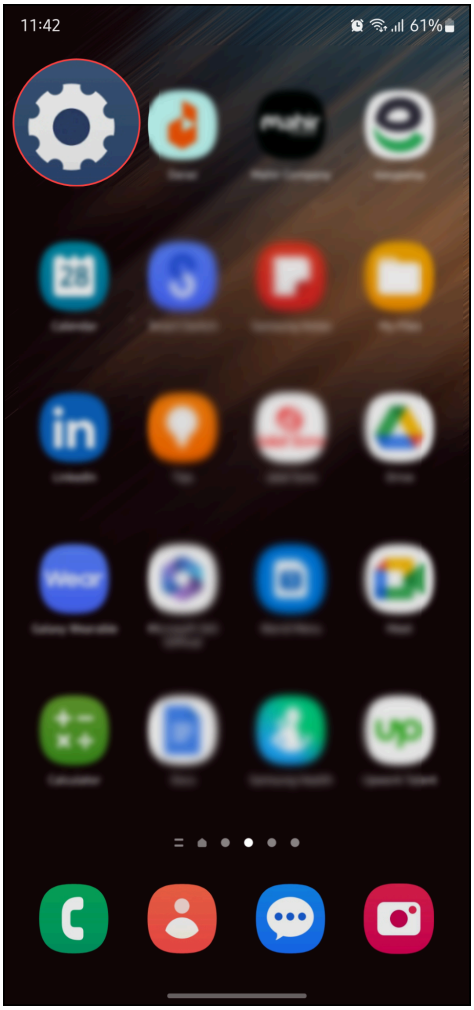
- The app selected to share project data showed errors indicating that it did not have access to the file. This has been resolved and now the project files can be shared again.

- In case of an inyector/platform device disconnection, the app did nothing causing an error sending command. The error is fixed. In case of disconnection, the app will try to reconnect.

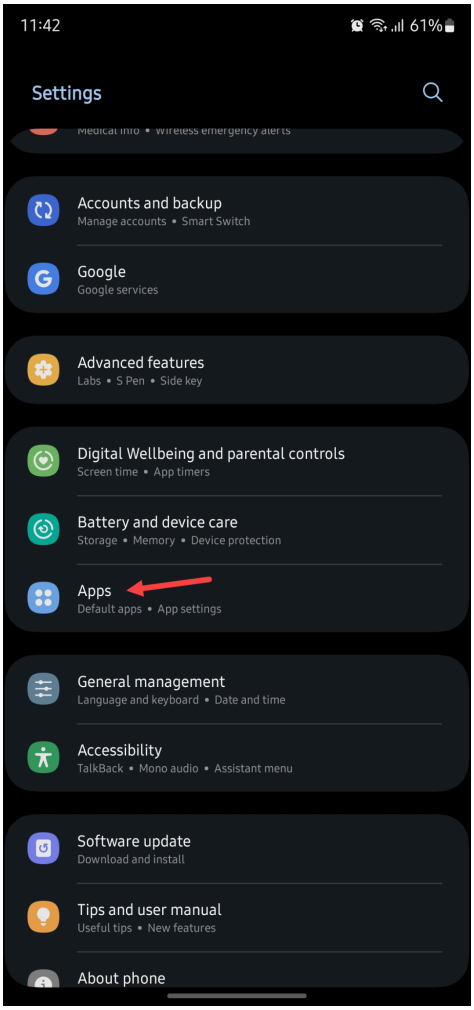
Troubleshooting

App does not Start. What Should I Do?

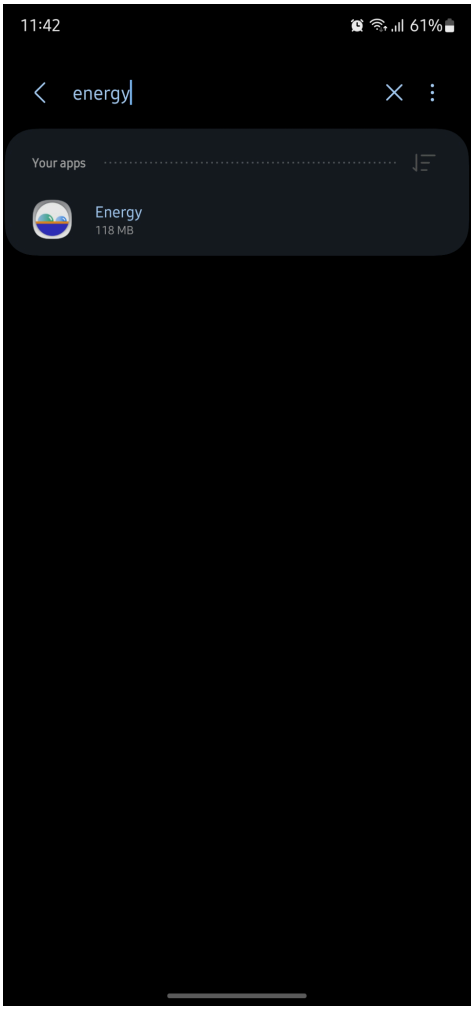
1. In case the app does not start, tap the Settings icon from your phone screen.



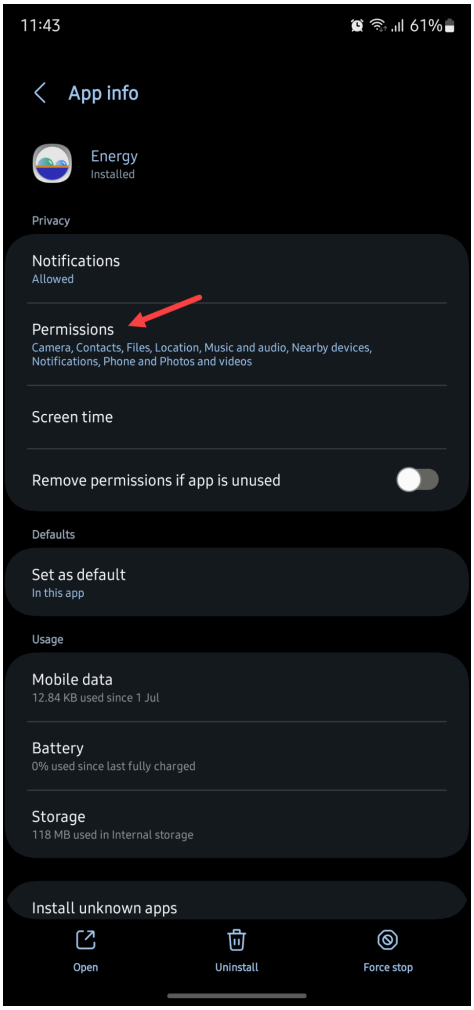
2. From the Settings app, tap Apps. This opens the Apps screen.



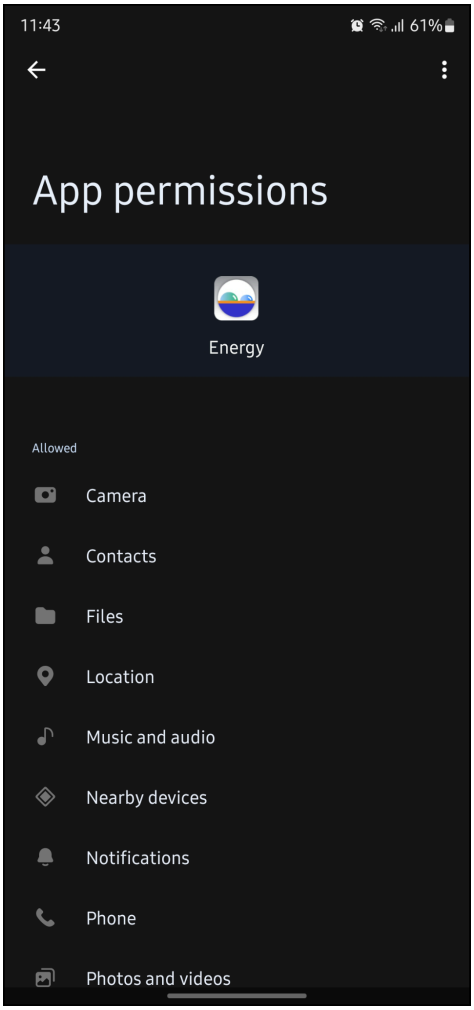
3. Here, locate and tap the Droplet Lab app. Doing so takes you to the App details screen.



4. Tap the Permissions button.



5. From the App Permissions screen, make sure that all permissions are allowed.



What to do if Smart Contact Points cannot Capture the Contact Points Precisely?

In such cases, it is recommended to deposit the drop as possible to the camera as the maximum focus allows which is the maximum value of the focus slider. Alternately it is an error with the image calibration number; measure the needle thickness and try the calibration process again.

What to do If Smart Points does not Process the Image Correctly?

Try using extended points or manual detection instead of smart. Extended contact points uses more of the droplet profile. It is particularly useful with images with more than 120 degrees of contact angle. Manual contact forces the system to calculate the angle at the point the user wants to. If this doesn't work, there may be problems with the image quality. Retake the image with different lighting conditions

What to do if the App Activation QR is not Working?

In case the app activation QR code does not work:

1. Make sure that the device has an active internet connection.
2. If the problem still persists, contact Droplet Lab support at **support@dropletlab.com** for assistance.

How can I Work Offline?

Once the app is activated, it does not require an internet connection to work.

I Forgot my Password and Secret Answer. What should I Do?

In this case, use the backup feature of the app to restore all the data from your previous account.

In case you need assistance in the account recovery process, please contact Droplet Lab support at **support@dropletlab.com**.

What to do if I Cannot Locate the Image I want to Upload?

Please note that only the images in PNG, JPEG, and JPG format are supported by the app.

The Image is not Focused During Photo Capture

Use the Focus button located atop the screen to adjust focus.

During Photo Capture, the Image is Too Bright or Too Dark

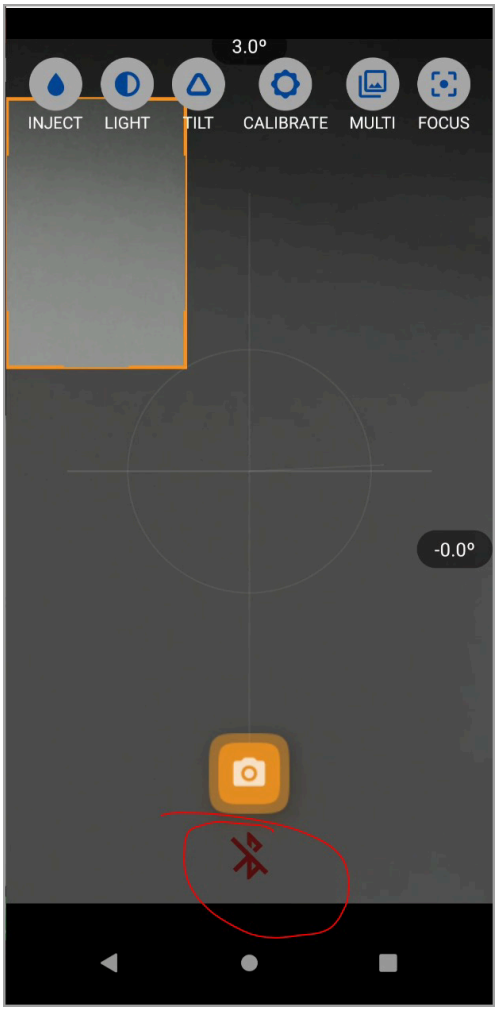
Use the LED backlight on the baseplate to adjust the background contrast.

Also use the light control on the phone screen to adjust the intensity.

What to do if the Connection to Injector/Platform Device is Red?

In this case, verify that the injector/platform is connected to the power.

Click the Reconnect icon to reconnect the device.



Restart the injection device.

What to do if the Injector/Platform is not Moving?

If the injector is not moving, verify that the bluetooth icon connection is green.

Verify the injector/platform cable is connected

Batch calculation does not work correctly for images taken in different sessions

Images taken in different sessions may have different calibration or different base lines. It is recommended to have different sessions in different projects.

What to do if the calculation with Young Laplace method is not consistent?

Please ensure that the calibration is correct for that photo. If the images between sessions are taken and different distances the calibration will not be the same for all of them.

FAQs

Do you sell the app on its own?

For accuracy purposes, we are restricted to using Motorola Stylus phone or an iPhone (iOS 15 or above) as we need access to raw images to best utilize our image processing algorithms. If you have access to either of the phones, we will simply give you the rest of the setup at a reduced price.

Over the years, would your company be replacing the Smartphone as the manufacturer support is discontinued?

Yes! You only need to purchase the updated phone model. We will provide compatible apps for the new phone model free of cost.

Would there be Software Updates / Patches available?

Yes! We include free software updates for your device lifetime (5 Years)

What is the Warranty on the Instrument?

The instrument has a 1-year warranty with the exclusion of consumables (i.e. syringe, needle, batteries). Phone warranty is up to the device manufacturer (Motorola). It is currently 1-year on the phone model included in the package.

What are the best practices for Contact Angle Measurement?

- Practical surfaces and coatings naturally show contact angle hysteresis, indicating a range of equilibrium values.
- Measuring static contact angles provides a single value within this range.
- Solely relying on static measurements poses problems, like poor repeatability and incomplete surface assessment regarding adhesion, cleanliness, roughness, and homogeneity.
- Practical applications require understanding a surface's liquid spreading ease (advancing angle) and removal ease (receding angle), such as in painting and cleaning.
- Measuring advancing and receding angles offers a holistic view of liquid-solid interaction, unlike static measurements, which yield an arbitrary value within the range. Hence, we recommend doing Advancing and receding contact angle measurements.
- You can check out the advancing and receding contact angle measurement here.

What are the best practices for Surface Tension Measurement?

- The best results for the pendant drop methods come when the droplet is at the cusp of detaching from the capillary. At this point, the droplet is significantly "deformed"; taking a raindrop-like shape.
- This is because the surface tension of the droplet is trying to resist the force of gravity stretching the droplet. Thus, when the droplet is significantly deformed,

surface tension is pushed to its limits. measuring the surface tension here will give the best results.

- The best approach for generating a well deformed drop is:

1. Slowly increase the volume and remember the shape of the drop just before the drop detaches from the needle.

2. Generate a second drop with the similar shape as the last one before detaching.

- The criterion deciding the volume is whether the liquid drop is well deformed (not a spherical shape).
- Generally, a larger needle will help with this. We suggest using a flat head needle with a diameter larger than 1.75mm.
- Also, be as accurate with the image calibration number (measurement of the outside diameter of the needle) as possible.
- Capture the images quickly after the droplet is generated, to avoid contamination as the droplet is suspended in air.

Which methods are included for Surface Free Energy measurement?

Neumann method: This method involves use of only One Liquid.

Fowkes Method: This method involves use of Two Liquids (1 purely Dispersive liquid and 1 polar liquid)

Oss & Good method: This method involves use of Three Liquids (1 Dispersive liquid, 1 Acid, 1 Base)

How to choose among Neumann method, Fowkes Method & Oss & Good method for Surface Free Energy measurement?

These three methods are the most widely used methods to calculate the solid surface energy. Any of them can calculate the solid surface energy for you. However, the literature suggests that depending on the type of surface you want to do the measurement for, one/ two of these methods may perform better than others. So, we suggest that you first check what method is most widely used for your sample in the literature and select the same when you do your measurement.

How fast should I increase or decrease the flow rate the drop size when I want to do advancing & receding contact angle measurement?

We suggest using the flow rate of 1-2 ul/s. One rotation of the syringe plunger included in the package means 5ul. You can calculate the rotating speed based on this value.

How do I calibrate the instrument?

We provide a bubble level to level the stage. You need the image calibration number (outer diameter of the needle) and the gravity if you are using Yonge-Laplace method for measurement. You do not need to do any calibration for the Polynomial fitting method. No other calibration is needed. You can check out the entire calibration process here.

What is the difference between Polynomial & Young-Laplace fitting?

Young - Laplace Method	Polynomial Method
Uses the whole drop profile to calculate the contact angle value	Uses only a certain percentage of the drop profile to calculate the contact angle value.
Only compatible with an axisymmetric drop. This is not always seen in practice, as a needle is typically inserted into the drop to increase/decrease the drop volume.	Compatible with both axisymmetric and non-axisymmetric drops.
Measurement results are more consistent compared to the polynomial fitting method.	Measurement results are less consistent, as they are affected by local surface imperfections.

Can you do Interfacial Tension Measurement between two immiscible liquids?

Yes! We can do Interfacial Tension Measurement between two immiscible liquids using pendant drop method in our Surface tension module.

Can you do Captive Bubble Measurement?

Yes!

How fast can your camera take pictures?

10fps

Is it possible to use the instrument offline?

Yes! Once the app is activated, it does not require an internet connection to work.

What is the maximum Syringe Diameter that can be loaded on this equipment?

We have a one-size, syringe holder currently for the size of Hamilton syringe we ship in the package. If you need it to be wider, just let us know what size you need and we can custom design one per your requirements.

Can you record a video?

We can capture multiple images and play it back as a video.

What will I receive in the Box?

Check out our Unboxing video to understand what you will receive in the package.

What is the difference between the Standard & Automatic version of the Flagship model?

In the standard version, the drops will be generated manually. We include the below syringe from Hamilton in the package.

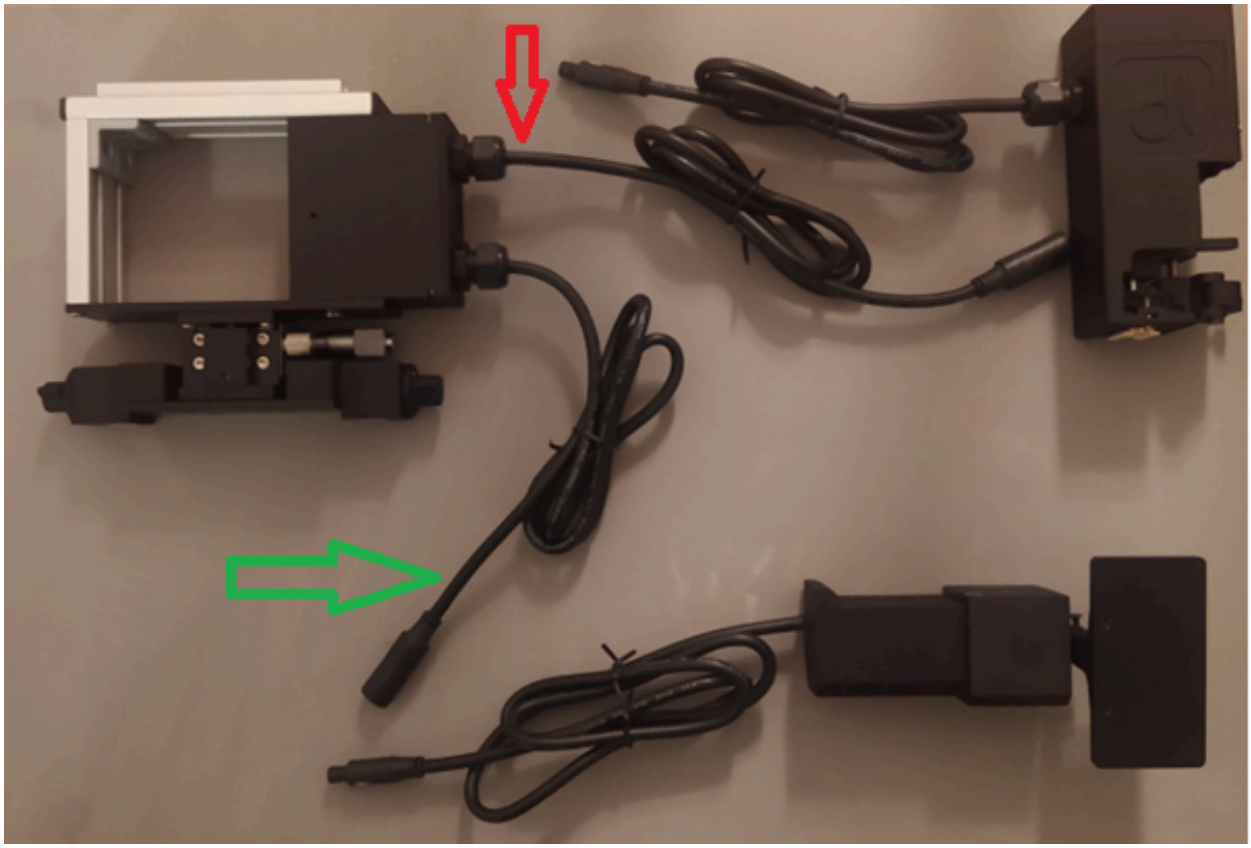
https://www.hamiltoncompany.com/laboratory-products/syringes/81242

Additionally, for the sliding angle measurement, the tilting of the stage will be manual.

In the automatic version, you can generate the drop with a set volume and the flow rate. Additionally, for the sliding angle measurement you can choose the tilting rate and angle.

Everything else apart from these 2 components is the same.

How to Assemble the Automatic Dropper & Sliding Stage?

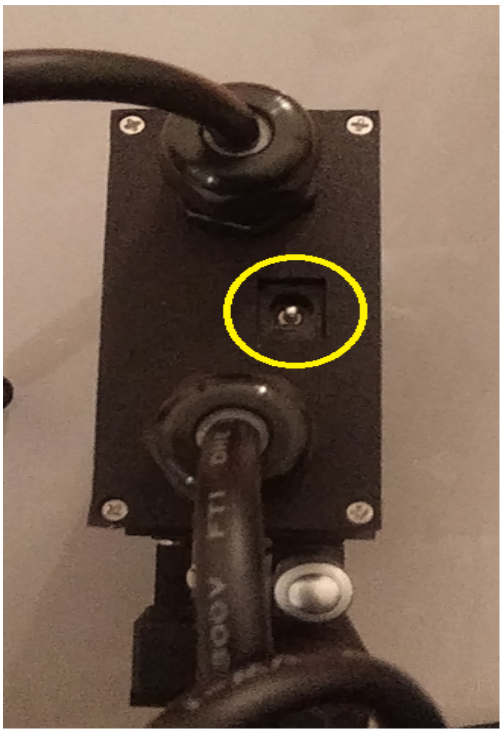


Note: Before we delve into each step, it is imperative to note that the wire at the top (with the red arrow) is for the automatic injector whereas the one at the bottom (with the green arrow) is for automatic rotation stage.

Hardware

1. Make sure that the white lines are aligned and push them in so that the connectors are connected.
2. Do this activity for both the injector and sliding stage.

3. Use the jack to plug the power adapter. The jack is highlighted in the screen below.

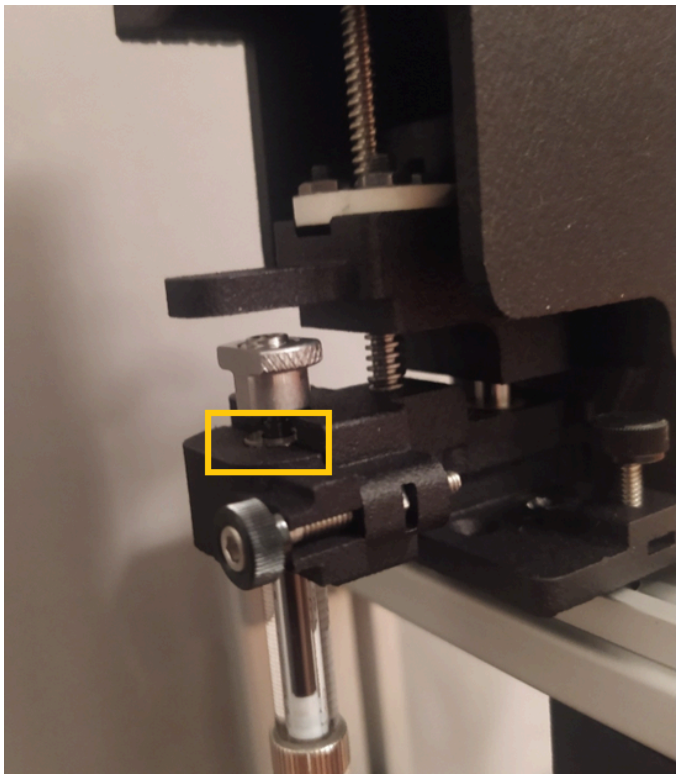


4. Power adapter being successfully plugged looks as shown in the image below.

5. Slide the injector onto the stage. Use the thumb screws to ensure that the injector is locked in.

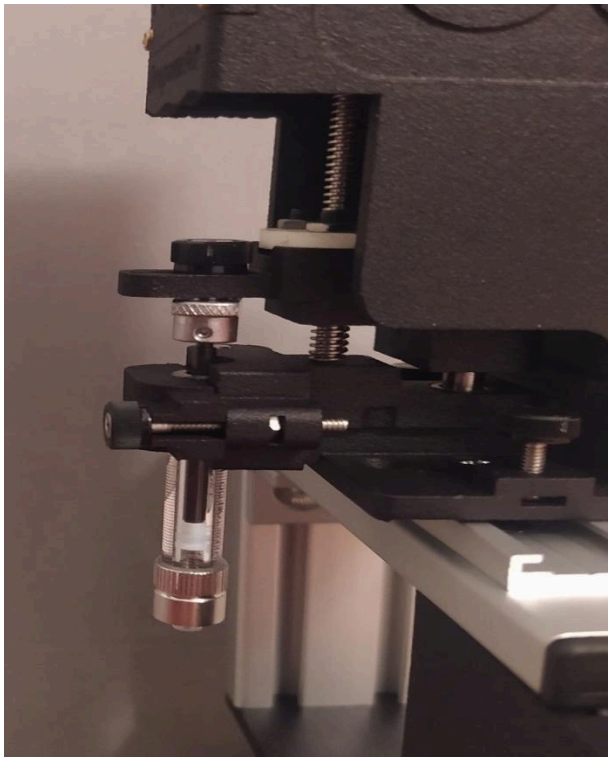
6. Once that is done, add the syringe to the stage.

7. Lock the body of the syringe into the injector. Make sure that the top of the glass barrel is aligned with the front latch.



8. Use the thumb screws again to attach the plunger of the syringe to the injector.

9. Once attached, the automatic dropper looks as displayed in the image below.

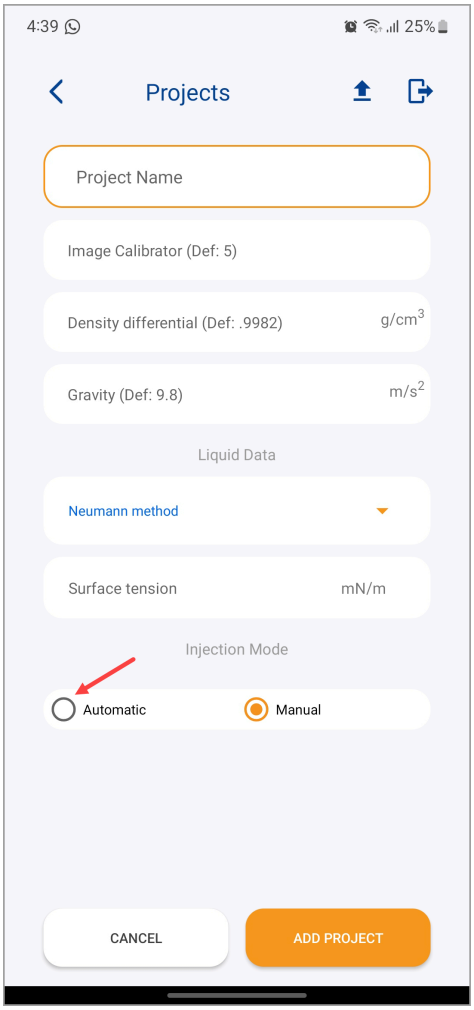


10. Here is how a completely assembled automatic dropper looks like.

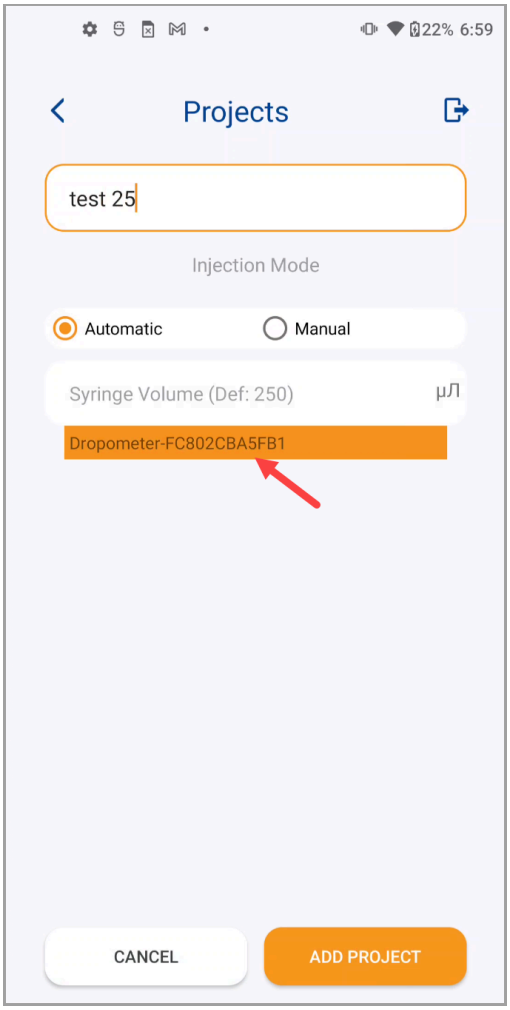
Mobile Application

1. From the Projects screen, tap the Add Project button. This opens the project creation workflow.

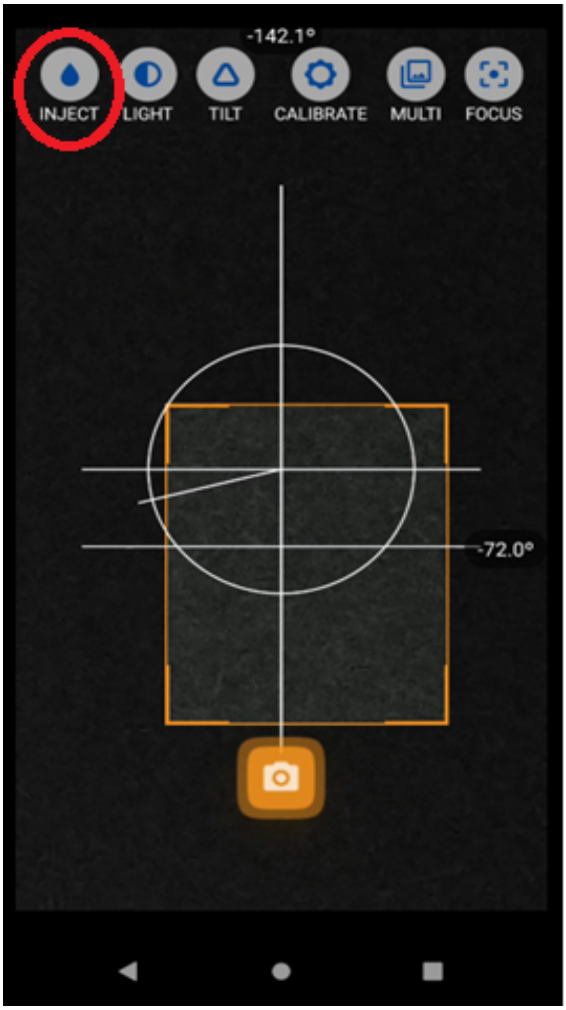
2. From the Injection Mode, select Automatic by tapping the Automatic radio button.



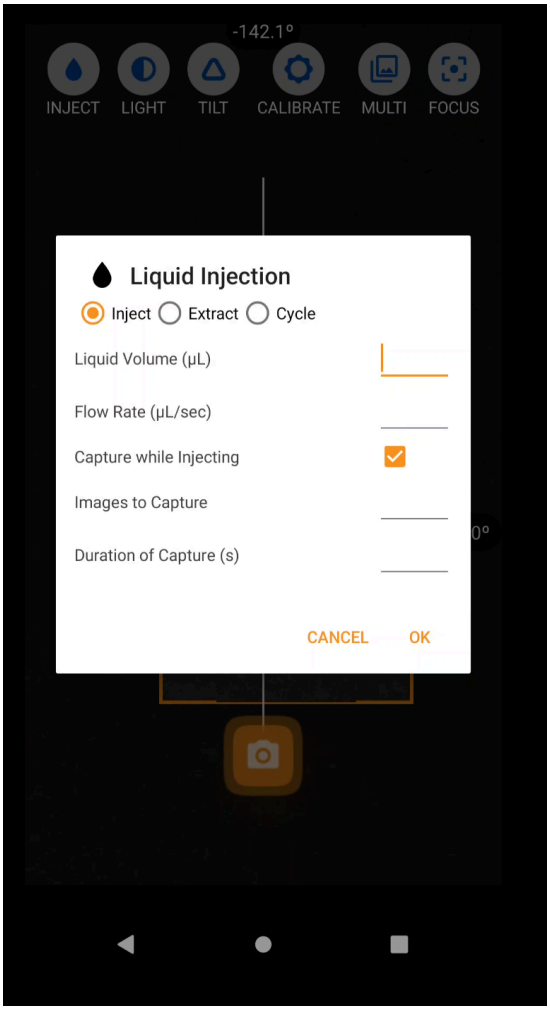
3. Once selected, enter the name of the project in the Project Name field.
4. Upon entering the project name, wait for the dropometer to be displayed.
5. As it is displayed, tap the dropometer name so that it gets selected.

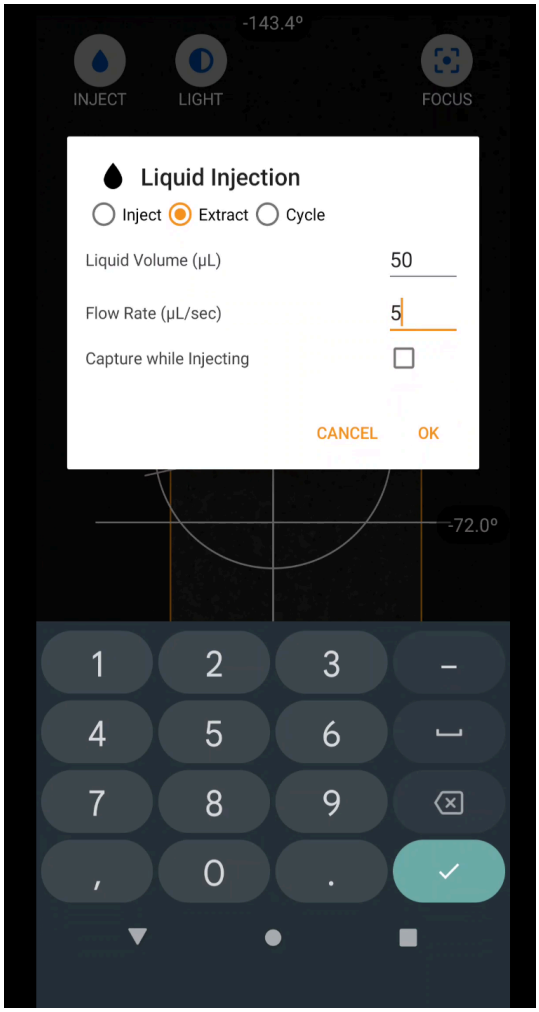


6. From the capture screen, tap the Inject button at the top so that you can control the injector.

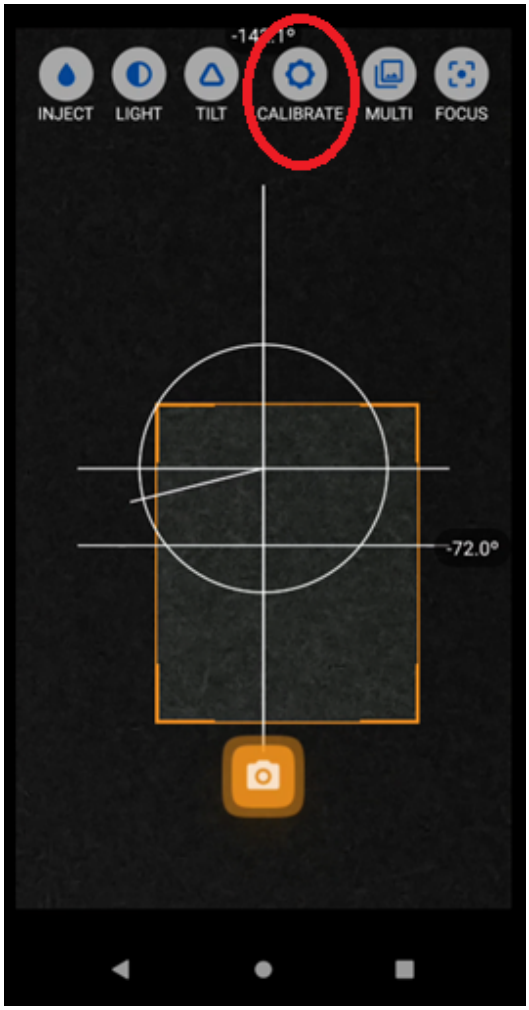


7. As a result, the Liquid Injection popup is displayed. From here, choose the inject, extract, or cycle option as per your project requirement.

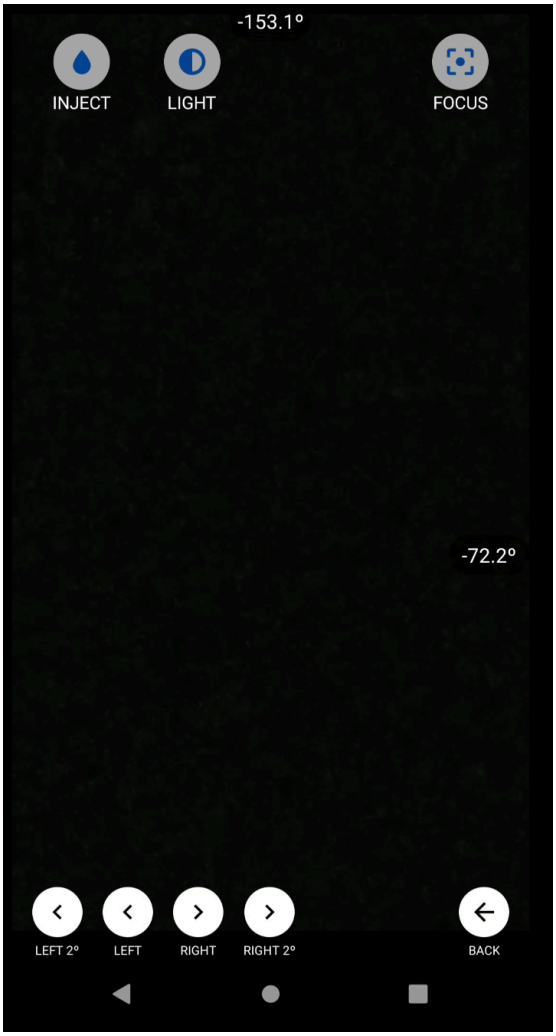

-142.1°
INJECT
LIGHT
TILT
CALIBRATE
MULTI
FOCUS
Liquid Injection
Inject
Extract
Cycle
Liquid Volume (µL)
Flow Rate (µL/sec)
Capture while Injecting
Images to Capture
Duration of Capture (s)
CANCEL
OK



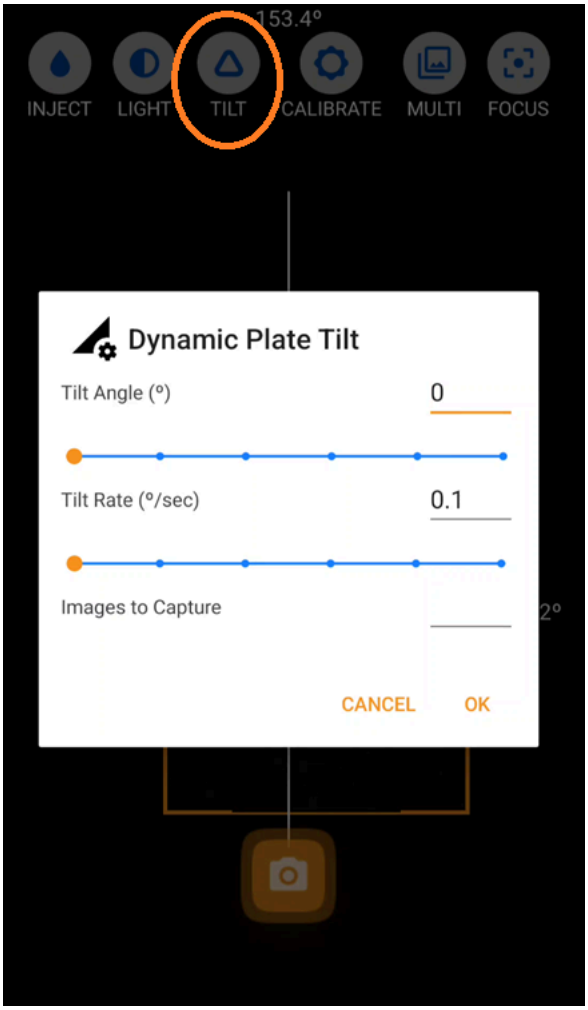
8. Once that is done, tap the Calibrate button.



9. As a result, the calibration options are displayed. This aids levelling of the tilt stage. To ease it further, place a bubble level on the stage.



10. After that, tap the Tilt button. This opens the Dynamic Plate Tilt popup allowing you to set the Tilt Angle, Tilt Rate, and the number of images to capture.


153.4°
INJECT
LIGHT
TILT
CALIBRATE
MULTI
FOCUS
Dynamic Plate Tilt
Tilt Angle (°)
0
Tilt Rate (°/sec)
0.1
Images to Capture
CANCEL
OK