KH Carer KH Detector

User Manual

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www.kamoer.com

Reading Tips

Quick search keywords
PDF documents can use the search function to search for keywords. For example, in Adobe Reader, Windows users can use the shortcut Ctrl+F, and Mac users can use Command+F to search for keywords.

Click on the directory to jump
Users can understand the content structure of the document through the table of contents, and click the title to jump to the corresponding page.

Print the document
This document supports high-quality printing.

Symbol Description

Prohibited Important Notices Operation and usage tips Reference information

Safety Instructions

Please read these instructions carefully before using the KH Carer to ensure proper operation.

Using of pH electrodes:

- Before using the pH electrode, remove the electrode cap so that it can be detected normally.
- Before first use, please calibrate the pH electrode
- During the use of the pH electrode, it is necessary to avoid drying of the electrode head. After each test of the pH electrode, the liquid should be stored in the beaker to continue to protect the pH electrode.
- When not in use for a long time, the pH electrode should be stored in an electrode cap with protective solution
- The pH electrode has a service life, which varies according to the use environment. Generally, it is about one year. During the pH calibration, it will prompt whether the pH electrode should be replaced.

The KH test solution is stirred at least once a week, otherwise the concentration may be unstable. The stirring can be shaken or magnetic stirring can be used.

Use protective packaging to protect the appliance from any damage during transport. After unpacking, dispose of all packaging elements in a manner that will not harm the environment. All materials used

to package the utensils are eco-friendly; they are 100% recyclable. Caution! When unpacking, keep packing materials out of the reach of children.

This device should not be used by young children and vulnerable groups with limited physical, sensory or mental abilities, and by persons unfamiliar with this device.

Usage Advice

Kamoer provides the following documentation for users of KH Carer:

1. "KH Carer User Manual"
2. "KH Carer Quick Start Guide"

Recommended that users first read the KH Carer Quick Start Guide to understand the usage process. For detailed product information, please read the " KH Carer User Manual ".

Download Kamoer Remote App

1. Scan the QR code to download the app corresponding to the icon below.

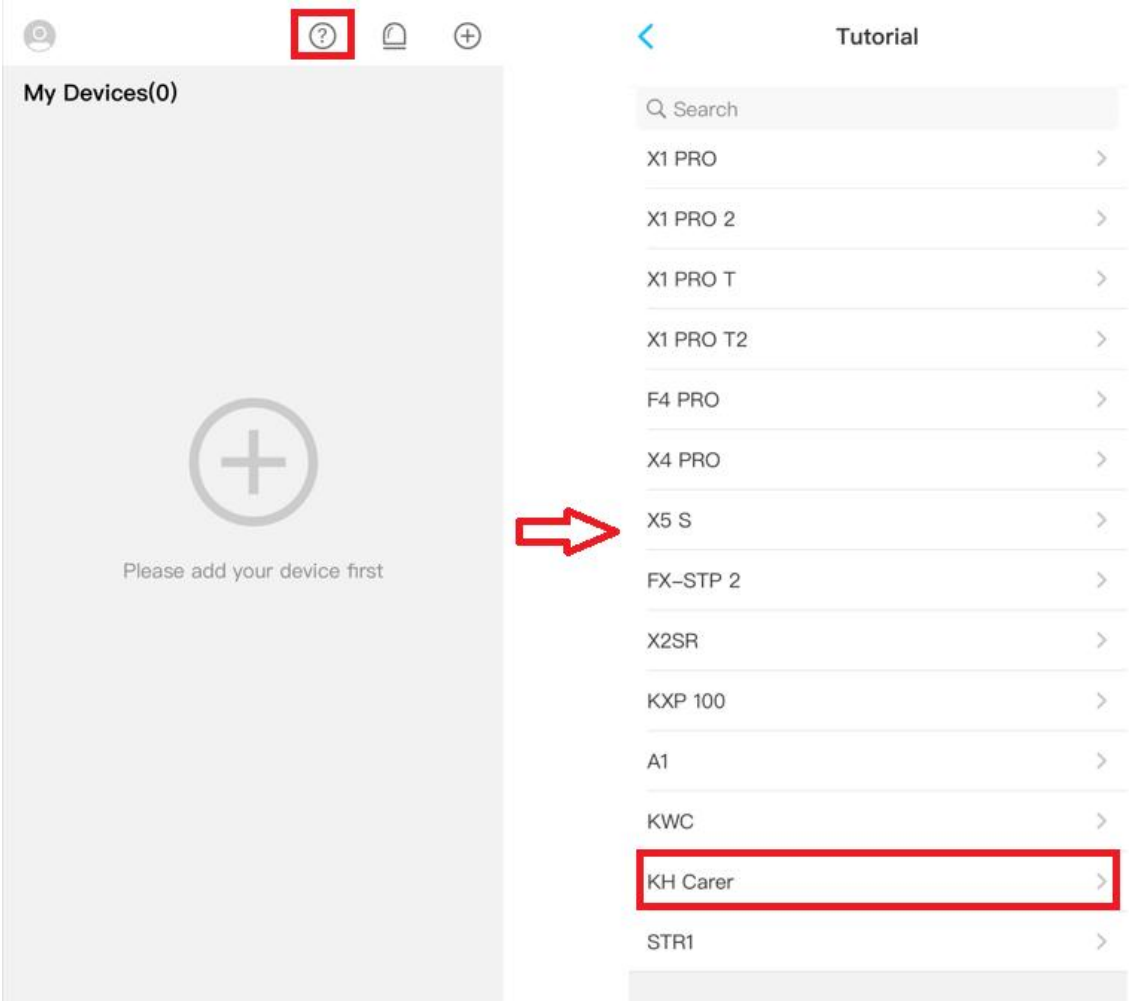
Apple

Android

2. Apple users enter the App Store, Android users enter the Baidu app store, search for "Kamoer Remote", and find the app with the corresponding icon to download.
   Kamoer Remote App supports Android 4.4 and above , and iOS 9.1 and above .

Get the tutorial

After installing the app, open it, click the button in the upper left corner of the device list page to enter the my module , click the tutorial in the my module, enter the tutorial module, click to enter the corresponding device model, including the user manual and frequently asked questions.



Contents

Product Description

This chapter mainly introduces the features, applications and unpacking instructions of the KH Carer.

1. Product Overview

1.1 Introduction

KH Carer is an automated device for testing the KH value of aquariums. It includes manual detection functions, automatic detection functions, and pushes an alarm when an abnormality occurs. Users can easily view the test results and set the test parameters in the Android or iOS App. The device can also choose to automatically adjust the KH value according to the test results.

1.2 Feature Highlights

- Including a 2.8-inch display, you can check the device status at any time.
- Sampling pump, adding detection reagent pump and adding KH pump all use high-precision pump heads.
- The detection can be completed automatically and KH reagent can be added according to the detection results.

- Support automatic test and manual test two detection modes.
- Support pump flow calibration, pH calibration.
- Built-in real-time clock, automatically run according to the set parameters, power-down parameters are not lost.
- Supports iOS and Android remote WiFi control and local Bluetooth control.
- Support solution bottle capacity monitoring function, push alarm for insufficient solution bottle capacity.
- Supports the function of alarm push.

1.3 Applications

- Marine life feeding
  Including hard coral (SPS), soft coral (LPS) and polyculture coral (SPS/LPS).
- Other occasions where it is necessary to test KH and maintain KH

1.4 Unpacking Preparation

- Before opening the box, inspect the outer packaging for damage in transit.
- After unpacking, refer to the packing list in the appendix to confirm that all parts are missing and check for visible damage.
  If you find any defects during unpacking, please contact the manufacturer immediately.

1. KH Carer host
2. pH electrode
3. Electronic scale (3 kg)
4. Beaker
5. 5ml graduated cylinder
6. 10ml graduated cylinder
7. Power adapter
8. KH detection reagent tube
9. Seawater sample tube
10. Waste liquid tube
11. KH addition liquid in tube
12. KH addition liquid out tube
13. Burette holder
14. pH4 calibration solution
15. pH 9.18 calibration solution
16. KH detection reagent concentrate
17. Equipment back tube joint
18. Extract seawater sample filter head

19. Magnetic stirring rotor, placed in the beaker

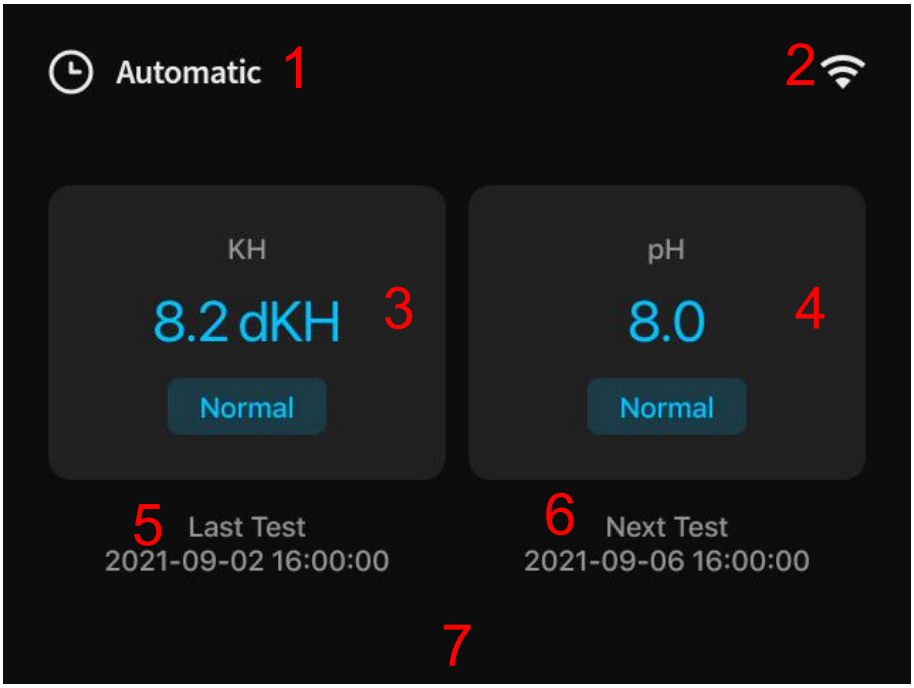
Notice:

- 5 ml detection reagent calibration cylinder is made of glass, be careful to prevent it from breaking and affecting safety.
- Electronic scales are used to measure the weight of items. Avoid placing items that exceed the range of the electronic scale (3 kg) to avoid damage to the electronic scale. Do not place items for a long time when not in use to avoid affecting the accuracy of the electronic scale.

1.5 Parts Name

1. Take seawater sample interface, connect to seawater tank
2. Add KH detection reagent interface, connect to KH detection reagent barrel
3. Add KH inlet, connect KH bucket
4. Add KH outlet, connect to seawater tank
5. Waste water outlet, connected to waste liquid bucket
6. Communication interface, connected to calcium counter control
7. Power DC12V 1.9A
8. Display
9. pH electrode
10. pH electrode fixing cover
11. Detection sample reagent reaction cup
12. Magnetic stirring rotor

1.6 Display State Description



1. Working mode: display working mode, the device supports automatic mode and manual mode
2. WIFI connection status:

 Indicates that the network is being configured

 Indicates that the network is successfully configured

 Failed to connect to the router

 Failed to connect to the server cloud

3. The latest test KH value and status display:
   Green means the test value is low, red means the test value is high, blue means the test value is normal
4. The pH value and status display of the last test:
   Green means the test value is low, red means the test value is high, blue means the test value is normal
5. Last time KH was detected (Manual/Automatic mode)
6. The planned time for the next KH test (Manual/Automatic mode)
7. Test status display area (Stopping/Detecting)

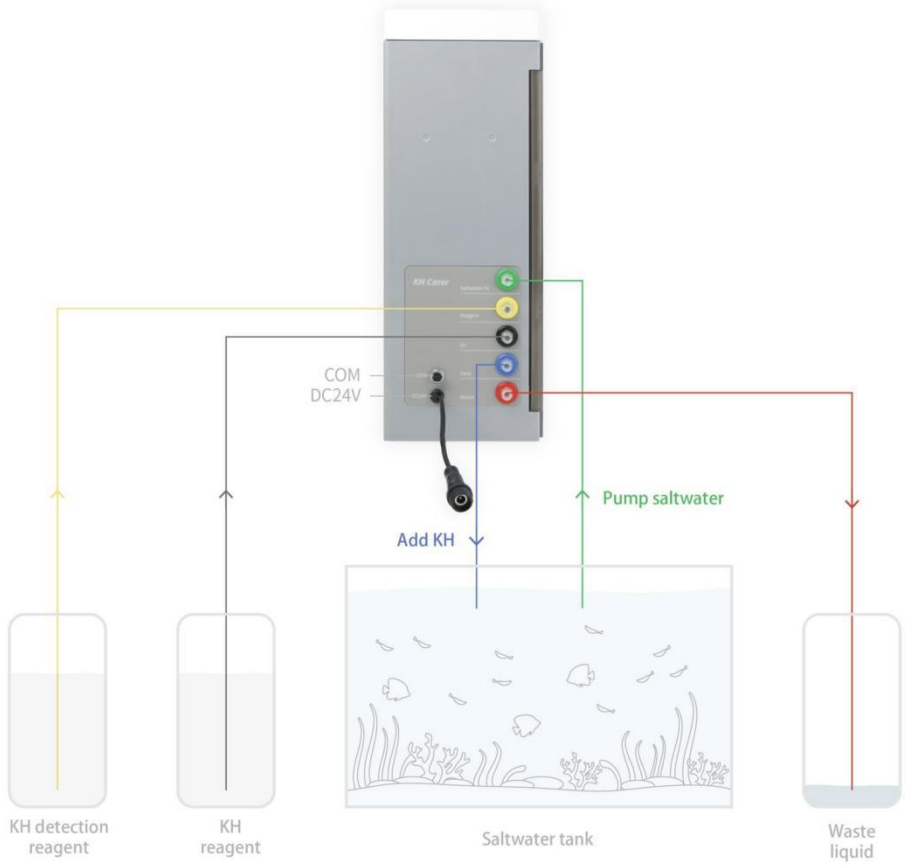
First Time Using

This chapter mainly introduces about check and confirm whether the functions of the equipment are running well for the first time

2. First Time Using

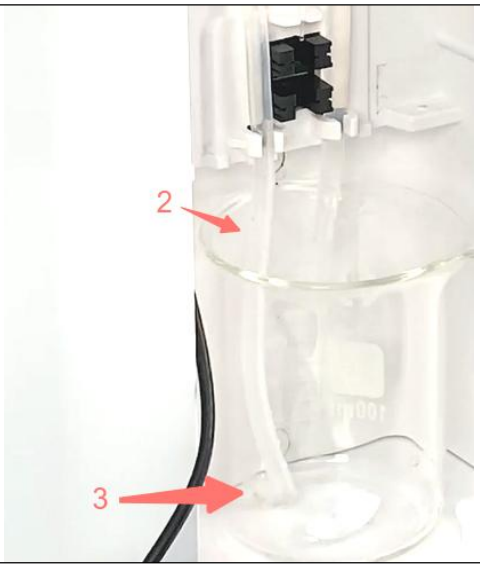
2.1 Product Installation

2.1.1 Tube Connection



Device interface	Meaning	Color	Connection and purpose
Saltwater IN	Seawater sample inlet	Green	Access to seawater tank for pumping seawater samples
Reagent	KH detection reagent inlet	Yellow	Access to KH detector barrel for KH detection reagent extraction
KH	KH reagent intake	Black	Access to KH barrel for extraction of KH reagent
Tank	KH reagent exported	Blue	Access to the seawater tank for adding KH reagent to the seawater tank
Waste	Wastewater outlet	Red	Access to the waste bucket for draining the waste liquid

2.1.2 pH electrode and Beaker

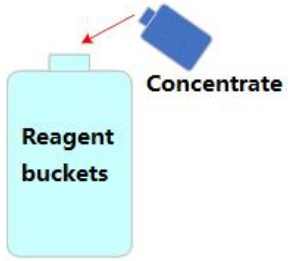
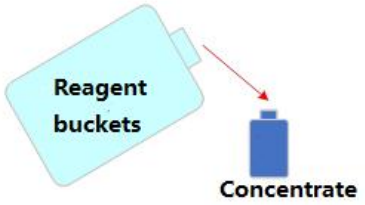
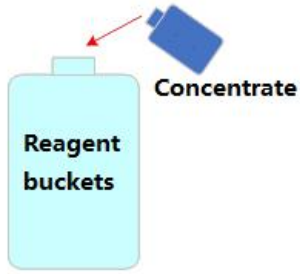
Illustrations and operating instructions	
	
1. Pull the **pH electrode (1)** down to the position shown	2. Place the **magnetic stirring rotor (2)** into the beaker
	
3. Place the **pH electrode (1)** and the **drain tube (2)** into the **beaker (3)**. **Note: The position of the waste liquid pipe should be close to the inner wall of the beaker to prevent the magnetic rotor from touching the waste liquid pipe when rotating**	
4. Insert the **pH electrode (1)** into a fixed position, confirm that the **drain pipe (2)** touches the bottom of the cup, and the installation is complete.	

2.1.3 KH detection reagent preparation

(If you are purchasing a ready-to-use KH reagent liquid, this step can be ignored)

The following is the dilution operation process of KH detection reagent concentrate (1L):

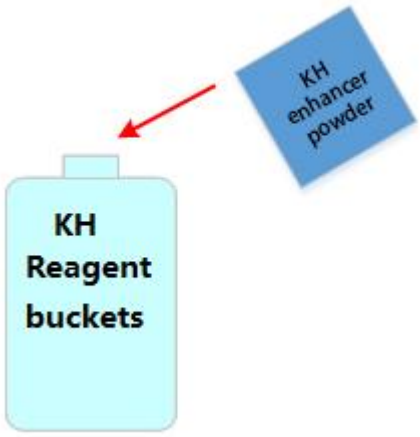
KH detection reagent concentrate is 20ml per bottle, KH detection reagent concentrate is configured according to 1 bottle of concentrate with 980g RO water, and one bottle of concentrate can be configured with 1L of KH detection reagent.

Diagram	Operating instructions
	1. Use an electronic scale to weigh 980 grams of RO water, 980 grams of water corresponds to 980ml of water, RO water can be obtained from the water dispenser. Note: Before measuring the water, peel the reagent bucket on the scale
	**2.** Pour a bottle of KH concentrate into 980 g of water and gently shake the reagent bucket.
	**3.** Pour the mixed reagent of water and concentrate in the second step into a part of the concentrate bottle and wash the concentrate bottle
	4. Re-pour the washed liquid into the reagent bucket 5. Repeat step (3) (4) once to complete the dilution of the concentrate

2.1.4 KH enhancer reagent preparation

(If you are purchasing a ready-to-use KH enhancer reagent liquid, this step can be ignored)

KH enhancer reagent is used to enhance the KH of seawater, when the KH is detected low, KH enhancer reagent needs to be added to make the KH value reach a suitable level.
The following is the operation process of configuring KH enhancer reagent:

Diagram	Operating instructions
	1. Weigh 1L of RO water using an electronic scale 2. Introduce the powder into 1L of RO water 3. Shake the reagent barrel, after 4 hours, confirm that all KH powder is dissolved and then use

2.1.5. After completing the installation of KH Carer, configure the App network

Refer to the App Usage → Distribution Equipment Chapter
After the network is configured, enter the device, the App will guide the first use operation, through these operations to ensure that the device is connected and used correctly, you can use it normally.

After the above check is done, manually run the test several times to confirm whether the test results are normal, and there is no problem to transfer to the automatic test.

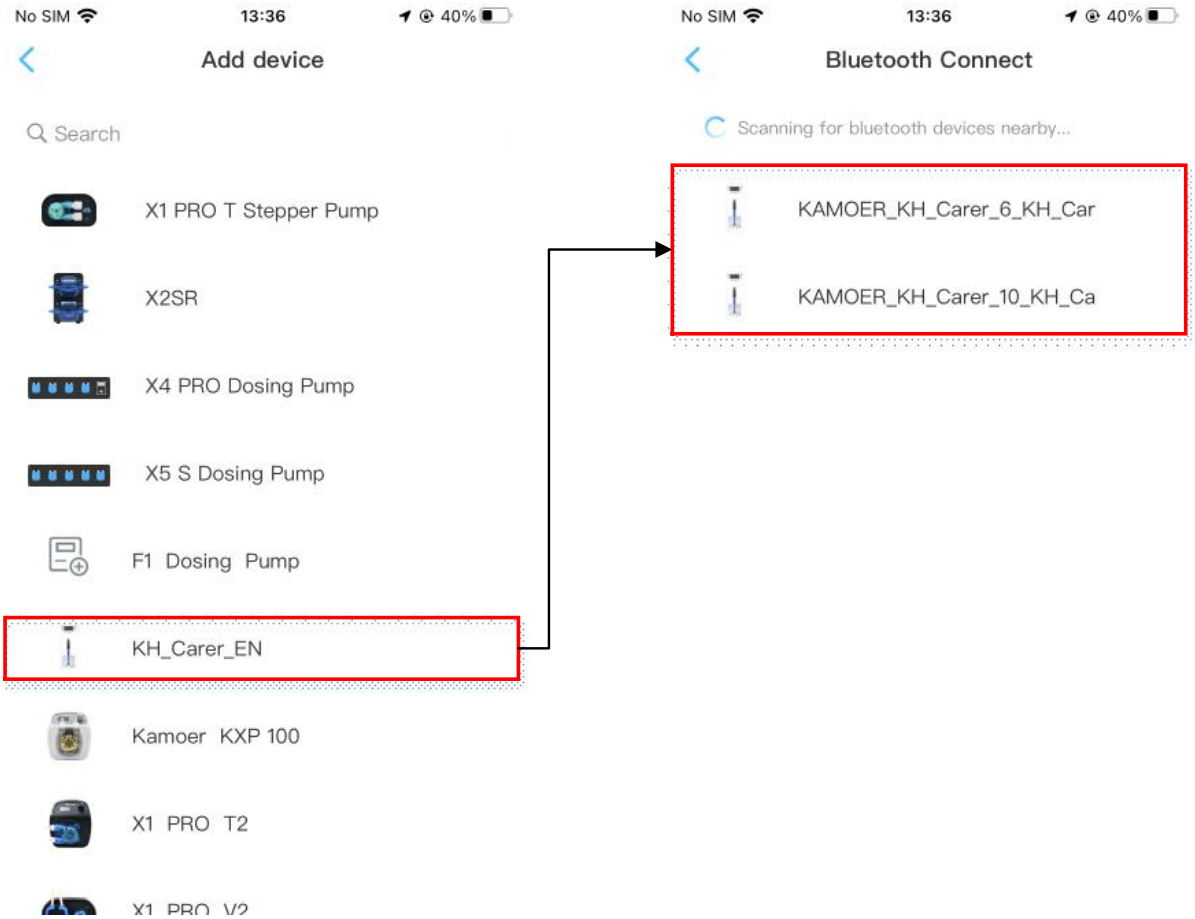
App Usage

This chapter mainly introduces how to use the app to control the KH Carer dosing pump.

3. App Usage

3.1 Network Configuration

The app needs to set and read the parameters of the device through a network connection, so the device configuration needs to be connected to the network. On the home page of the device list, click the Add button in the upper right corner to enter the configuration interface of the device, click KH Carer to enter the Bluetooth connection interface, and follow the interface prompts to configure the network.

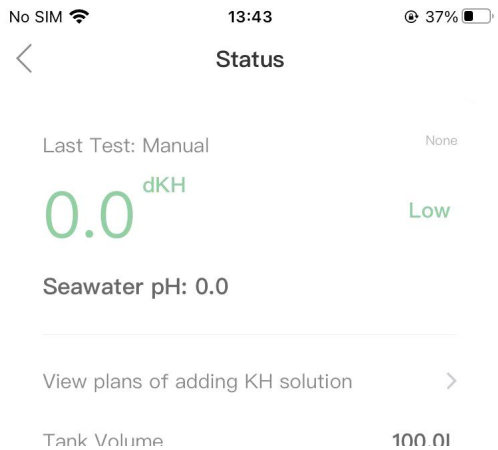


a. You only need to configure the device to connect to Wi-Fi once. After the configuration is successful, as long as the App can connect to the Internet , you can find the device in the device list after opening the App .

b. If the device configuration fails to connect to Wi-Fi, start over from the first step .

3.2 Overview of App Interface

Open the App, click KH Carer in the device list to enter the KH Carer operation interface.
The interface module functions are as follows:



a. Status:
Display various information of the device:
Last detection mode: automatic / manual, test time;
Last test: KH value, pH value, status (too high/normal/too low)
Cylinder volume display (100.0L)
reagent bottle status display, etc.

b. Detection:
KH manual and automatic detection parameter settings, the device can also be calibrated in manual mode

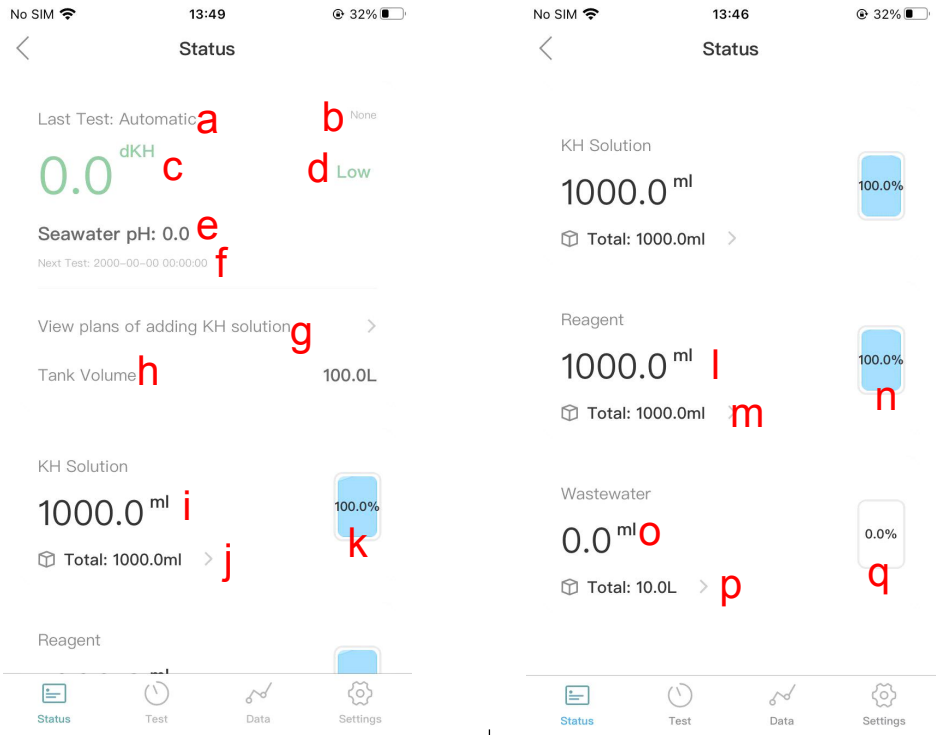
c. Data:

Graphical display of the detected historical data, you can easily view the changes in the historical records

d. Settings:

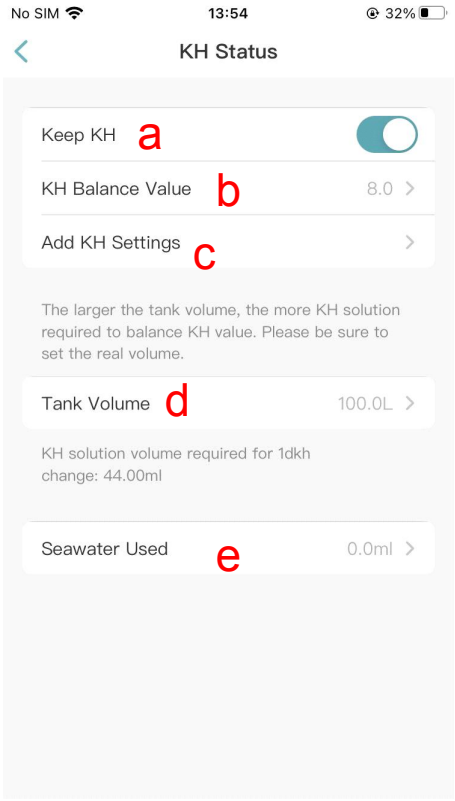
Includes device version and serial number viewing, firmware upgrades, time synchronization, alarm threshold setting and other functions

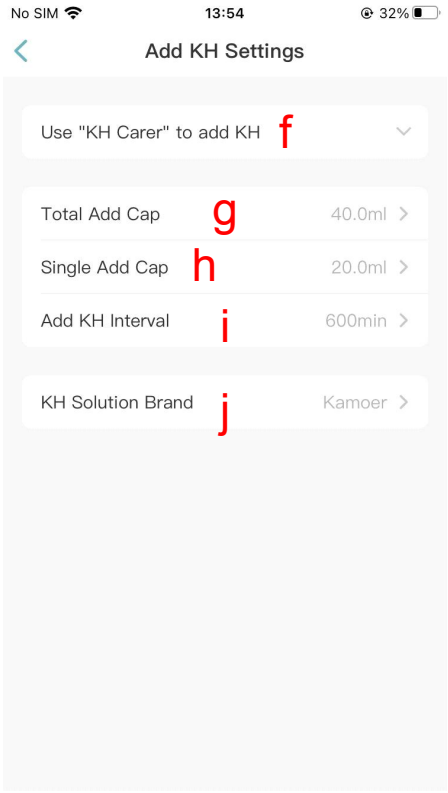
3.3 Status Interface Function (detected value, remaining solution, KH automatic hold)



a. **Working mode:** Manual mode or automatic mode
b. **Last test time:** Manual mode or automatic mode
c. **The KH value of the last detection:** Green means low, black means normal, red means high
d. **Detection status display:** According to the high and low threshold thresholds (too high/normal/too low), the high and low thresholds are set in the App system settings module
e. **pH value of last test**
f. **Next detection of KH:** Manual testing does not have the next test time
g. **Quickly adding KH:** When KH low, needs to be supplemented, and the execution plan for KH supplementation can be viewed here
h. **Tank volume:** click to enter the maintaining KH setting interface, where you can set the KH value of the tank that needs to be maintained. After each KH detection is completed, according to the size of the tank volume and the detected KH value, the Tank will be supplemented with KH enhancer reagent
i. **Remaining amount of KH reagent bottle solution**
j. **KH reagent bottle capacity:** click to modify
k. When the remaining amount of KH reagent falls below 10%, the device pushes an alarm
l. **The remaining amount of KH test solution**
m. **KH detection liquid bottle capacity:** click to modify
n. **KH detects the percentage of the remaining volume of the liquid bottle:** When the remaining volume of the detection liquid is less than 10% , the device will push an alarm
o. **The amount of waste liquid in the waste water barrel**
p. **The total amount of waste liquid barrels**
q. **Percentage of waste liquid volume:** When the waste liquid volume exceeds 90%, the device will push an alarm

3.4 Keep KH Status





a. **Keep KH switch:** When the switch is turned on, the KH Carer test KH value is low, the device will automatically supplement KH

b. **KH stable value:** When the KH switch is kept open, the KH Carer test KH value is low, and the device automatically supplements the value to be reached by KH

c. **Add KH Settings:** when the KH detection value is low, the way to add KH is set

d. **Tank volume:** Set the volume of water in the tank and use it to supplement the KH value. The volume of water in the tank should be set accurately, so that it is also accurate when supplementing KH. If you are not sure about the volume, you can estimate the volume of water to be smaller, so that you can supplement KH will not be excessive, and the insufficient amount will be replenished next time

e. **Seawater used:** Measure the amount of seawater sample used

f. **Supplement KH:** There are two ways to use KH Carer to add and use calcium to add back.

g. **Total add cap:** When the detected KH value is low, the maximum amount of KH added

h. **Single add cap:** If the amount of KH to be supplemented exceeds the maximum single addition amount, add it in multiple times

i. **Add KH interval:** the interval time when adding KH in multiple times

j. **KH solution brand:** the brand of reagent for adding KH, different brands have different KH concentration, in order to accurately supplement KH, you need to set the brand of KH reagent

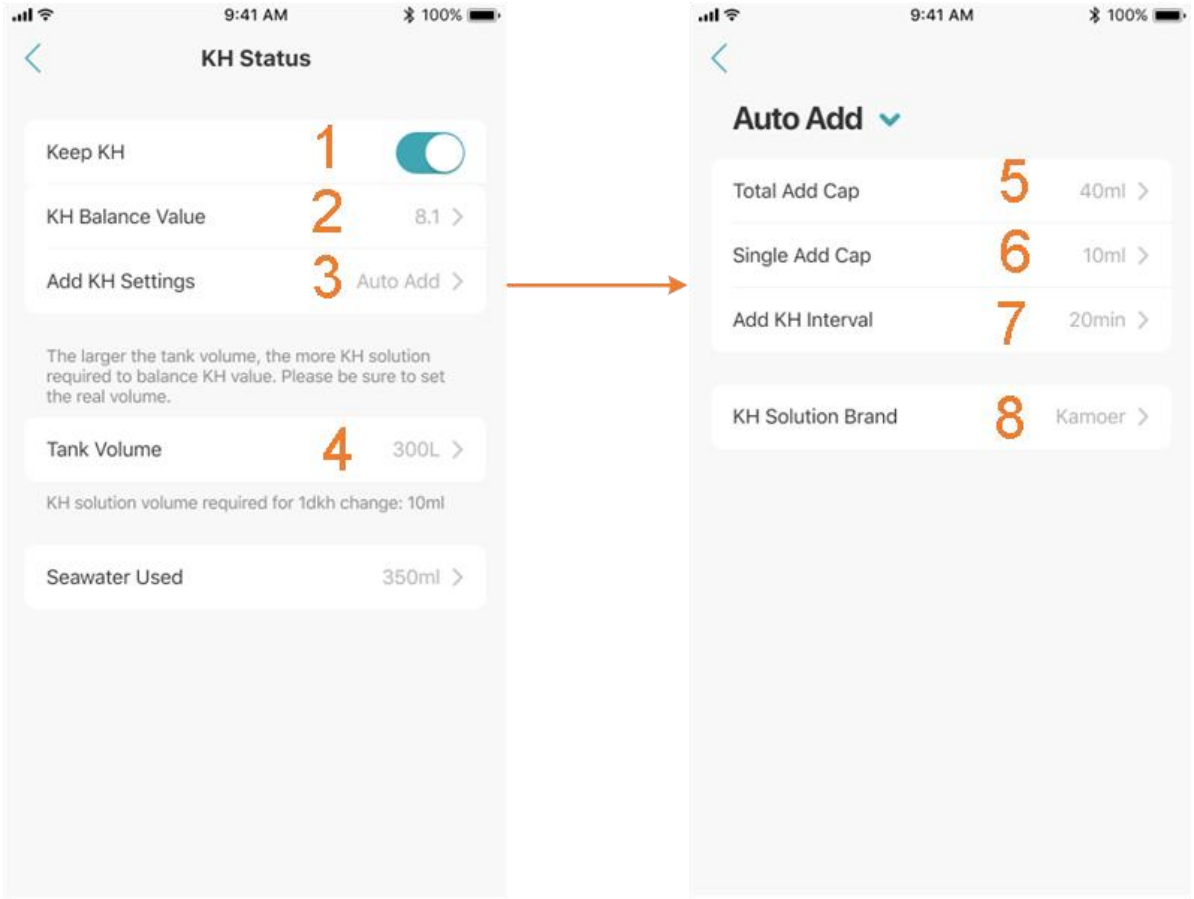
3.5 Supply KH enhancer reagent method

Methods	Function description	Characteristic

Add automatically	According to the volume of the tank, the KH value detected, and the set target KH value, the amount of KH enhancer reagent that needs to be replenished is automatically calculated, and then replenished	Not sure how much KH is consumed per day, it's completely regulated by KH Carer (this function needs to ensure that KH Carer is correctly calibrated and tested to be stable)
Custom plan	Set up a custom KH enhancer reagent titration plan, the dosing pump on KH Carer replenishes the KH enhancer reagent according to the titration plan, and when KH needs to be adjusted, affects the titration plan by one amount according to the KH value	Knowing the approximate daily KH consumption in the tank, the KH is supplemented in a planned manner by the titration pump, and the fluctuations of KH are fine-tuned by the KH Carer controlled titration pump
Use other pumps	Connect other Kamoer titration pumps, such as the F4 PRO, which performs the titration normally and fine-tunes the titration plan according to the tested KH value	1. KH Carer E1 accessories are required to connect KH Carer and F4 PRO titration pumps 2. Understand the approximate daily KH consumption in the cylinder, supplement KH with a planned plan through the titration pump, and the fluctuation of KH is fine-tuned by KH Carer control titration pump The adjustment of the 3.KH requires a variety of elements with multiple pump heads to complete
Use FX-STP	KH is adjusted by detecting the KH value and controlling the switching time of the calcium counter pump	1. KH Carer E1 accessories need to connect KH Carer and FX-STP calcium reverse pump 2. Use calcium anti to supplement calcium ions and KH

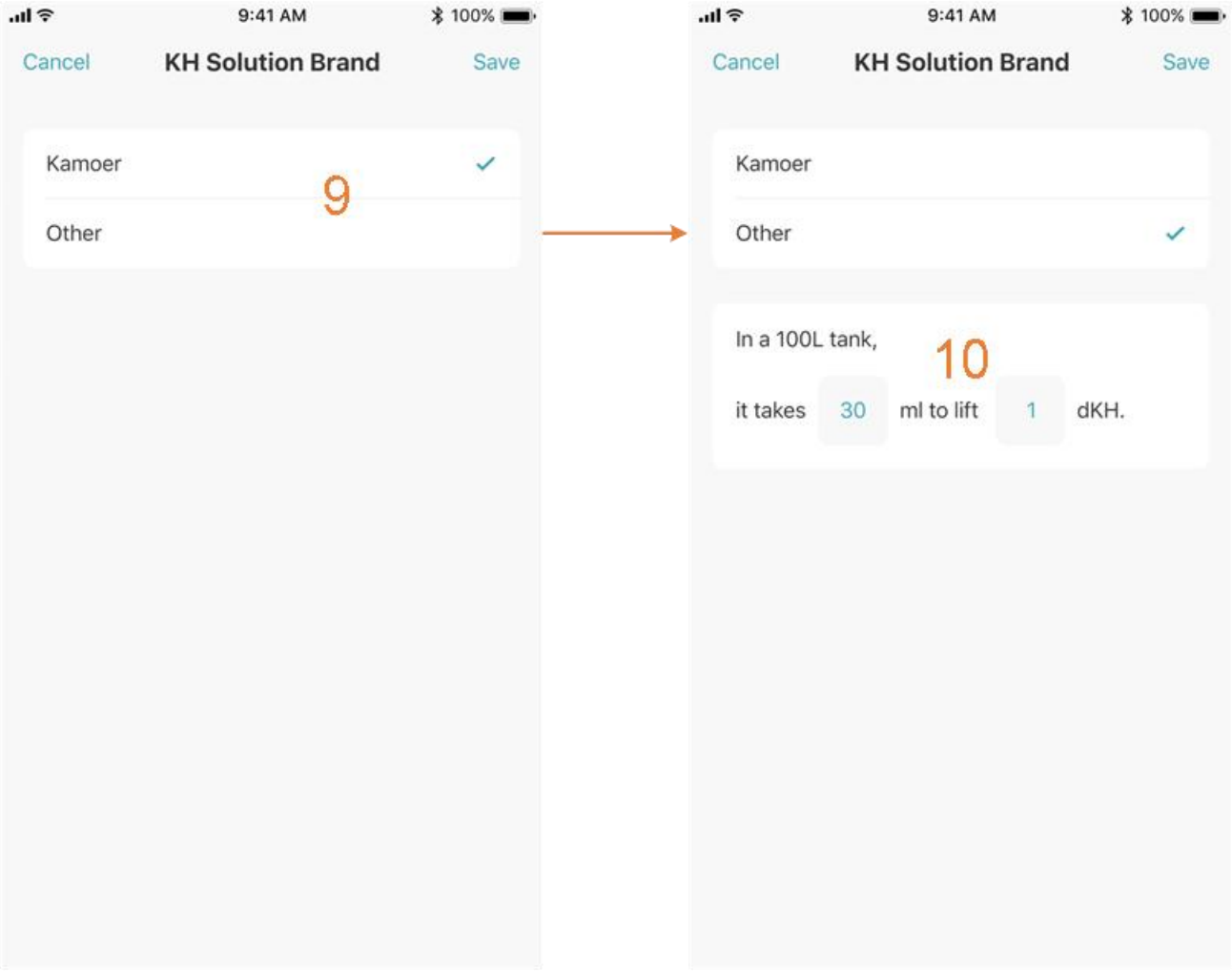
3.6 Auto Add

According to the volume of the cylinder, the KH value detected, and the set target KH value, the amount of KH lifter that needs to be replenished is automatically calculated, and then replenished



1. Automatic balance switch, turn on this switch, KH Carer will adjust KH
2. by adjusting the amount of KH lifter added. KH target balance value, if the detection KH value is lower than this target value, KH Carer will control its own KH enhancer reagent pump to add KH enhancer reagent, the amount added is based on the KH target value, the current KH detection value, the volume of the sea tank, the concentration of KH reagent
3. Click to enter the automatic add KH parameter setting interface
4. The volume of the cylinder, the volume of all the water in the tank, this volume affects the size of the KH enhancer reagent added, the same increase of 1dKH, the larger the volume of the water body, the greater the amount of KH lifter required, so in the case of uncertain volume of water in the tank, the volume of the tank should be set to a smaller setting, and it will not be added too much when adding KH enhancer reagent
5. The total amount of KH lifter is the largest, after this test KH, the maximum amount of KH can be supplemented, if the amount of replenishment needs to exceed this maximum amount, the pump will not replenish, KH Carer will re-evaluate the amount of KH enhancer reagent that needs to be added after the next test of KH value for supplementation
6. The maximum amount of KH enhancer reagent added at a single time, and if the KH enhancer reagent dose to be supplemented exceeds the maximum amount of a single KH lifter, it will be added in multiple times to prevent adding too much KH enhancer reagent and causing biological maladaptation
7. The interval between the addition of KH enhancer reagent, if the KH enhancer reagent dose to be supplemented exceeds the maximum amount of a single KH enhancer reagent, it will be added in multiple times, and the time interval here is the interval between the addition of KH enhancer reagent
8. KH enhancer reagent concentration setting, set the concentration of KH enhancer reagent used, if you are using a non-Kamoer brand KH enhancer reagent, you need to set this concentration, otherwise

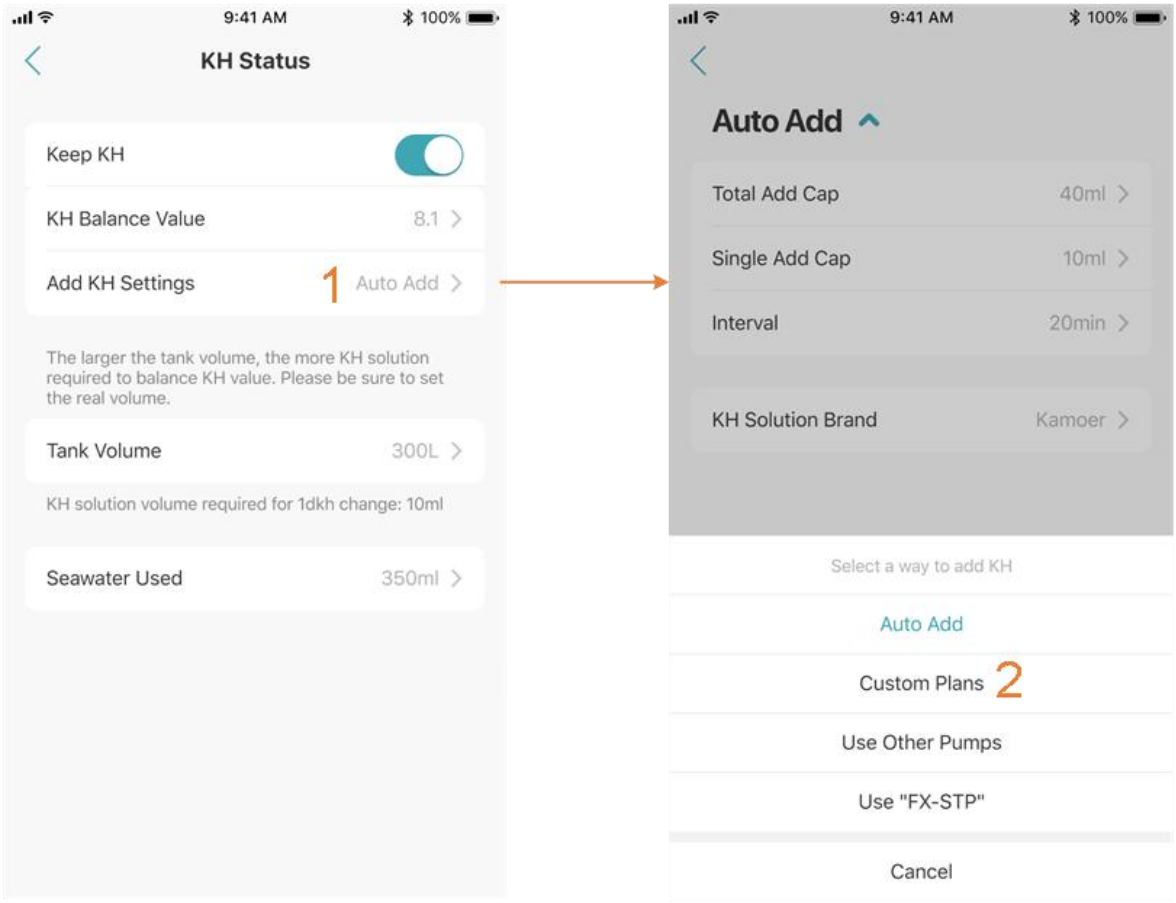
the amount of KH enhancer reagent added will be inaccurate



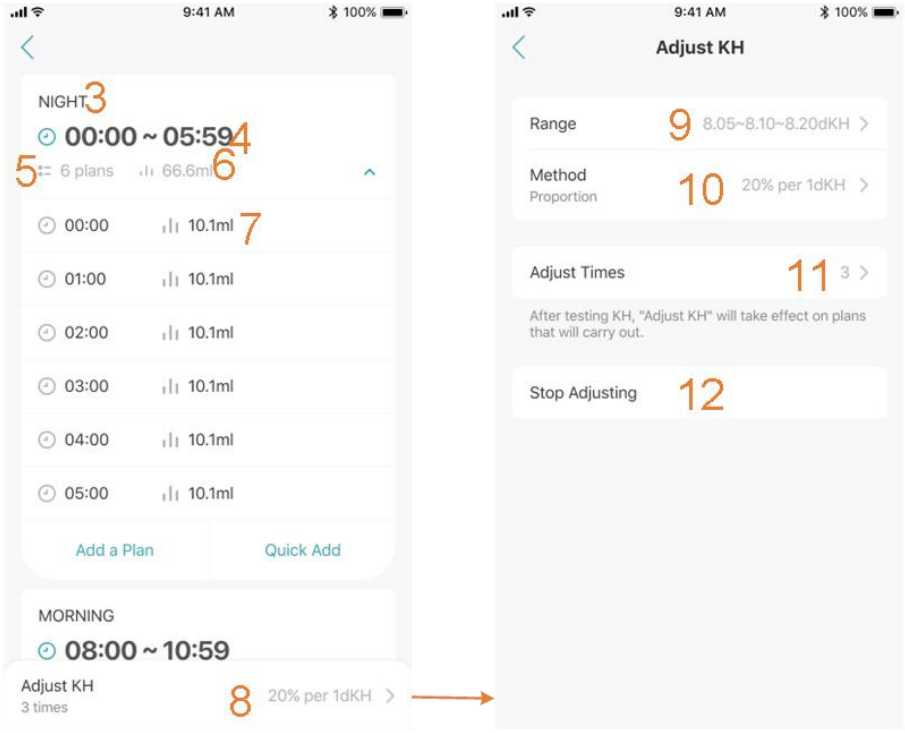
9. The brand of KH enhancer reagent, choose Kamoer brand KH lifter, the default concentration will be set, choose other brands of KH enhancer reagent, you need to determine 100L of water, how many ml of KH enhancer reagent is needed per 1dKH
10. 100L of water, how many ml of KH lifter is needed for each 1dKH enhancer reagent

3.7 Custom Plans

Custom dosing is to pre-set the amount and time of KH enhancer reagent addition, which can be set according to the schedule, and when the scheduled time arrives, the pump performs the amount added. This method is suitable for knowing in advance the amount of KH enhancer reagent that needs to be replenished in the tank every day, and it can be fine-tuned by KH Carer.



1. From the home status module → Keep KH → Add KH Settings, to enter the KH booster addition setting function interface
2. Select Custom Plans to enter the custom function addition interface



3. Plan group name, to create a titration plan you need to create a plan group first, create a titration plan within the plan group, the plan group can be set name, which is used to distinguish the titration of different time periods
4. Planning group time period, set the time interval for titration planning
5. Number of plans within the planning group
6. Total additions to the intra-group titration plan
7. Titration planning and titration
8. When the KH detection value exceeds the set KH range, KH Carer adjusts the KH value by adjusting the amount added to the titration plan
9. Adjustment range, 8.05~8.10~8.20, 8.05 and 8.20 in the figure above represent the upper and lower limit ranges, KH detection value in this range KH Carer will control KH enhancer reagent pump for KH adjustment, KH detection value if beyond this range, need the user to manually adjust the KH value. The middle 8.10 is the target balance value
10. There are two ways to adjust the titration plan, one is to adjust proportionally and the other is to adjust according to the amount
11. Number of impact plans, from the completion of the detection of KH value, the number of plans to adjust the impact of KH value
12. Stop the adjustment, stop the execution of the adjustment plan after stopping this KH test, and perform the adjustment if it is necessary after the next KH test

3.8 Examples of Pro-rata Methods

For example, the current KH balance value is 7.00, the range of KH adjustment is 6.00 ~ 7.00 ~ 8.00, and the KH adjustment method is proportional adjustment

KH Balance value	KH range of adjustments	The way to regulate (per d KH)	Number of reconciliation plans

7.00	±1 (According to the current equilibrium value, that is 6.0~8.0)	50%/ dk h	2

2 titration schedules are set up:

Plan 1 The amount added	Plan 2 The amount added
20m l	10m l

According to the above setup parameters, plan the actual amount added:

KH Detected value	Plan 1: Actual additions	Plan 2: Actual additions
5.0 (Beyond the range of KH regulation)	20m l	10m l
6.5	+ 2.5m l = 22.5m l	+1.25m l = 11.25m l
7.00	20m l	10m l
7.5	- 2.5m l = 17.5m l	- 1.25m l = 8.75m l

When the KH value is 6.5, the formula for calculating the proportion of impact of each plan is:

(7.0 - 6.5) *50%/ 2 = 0.125, (where 2 is the number of programs affected)

Plan 1 The amount added: 20 * 0.125 + 20 = 22.5

Plan 1 The amount added: 10 * 0.125 + 10 = 11.25

When the KH value is 7.5, the same algorithm can know what the proportion of each plan impact is

(7.5 - 7.0) *50% / 2 = 0.125

Plan 1 The amount added: 20 – 20 * 0.125 = 17.5

Plan 1 The amount added: 10 – 10 * 0.125 = 8.75

3.9 Example of Volume-based Adjustment

For example, the current KH balance value is 7.00, the range of KH adjustment is 6.00 ~ 7.00 ~ 8.00, and the KH adjustment method is to adjust according to the amount

KH Balance value	KH range of adjustments	The way to regulate (per d KH)	Number of reconciliation plans
7.00	±1 (According to the current equilibrium value, that is 6.0~8.0)	Amount 30m l	3

3 titration schedules are set up:

Plan 1 The amount added	Plan 2 The amount added	Plan 3 The amount added

20m l	10m l	4 ml

According to the above setup parameters, plan the actual amount added:

KH Detected value	Plan 1: Actual additions	Plan 2: Actual additions	Plan 3: Actual additions
5.0 (Beyond the range of KH regulation)	20m l	10m l	4 ml
6.5	+ 5m l = 25m l	+5m l = 15m l	+ 5m l = 9m l
7.00	20m l	10m l	4 ml
7.5	- 5m l = 15m l	- 5m l = 5m l	-5m l = -1m l < 0 (Does not run)

When the KH value is 6.5, the formula for calculating the amount affected by each plan is:

(7.0 - 6.5) * 30/ 3 = 5, (where 3 is the number of projects affected)

Plan 1 The amount added: 5 + 20 = 25

Plan 2 The amount added: 5 + 10 = 15

Plan 3 The amount added: 5 + 4 = 9

When the KH value is 7.5, the same algorithm can know what the proportion of each plan impact is:

(7.5 - 7.0) * 30 / 3 = 5

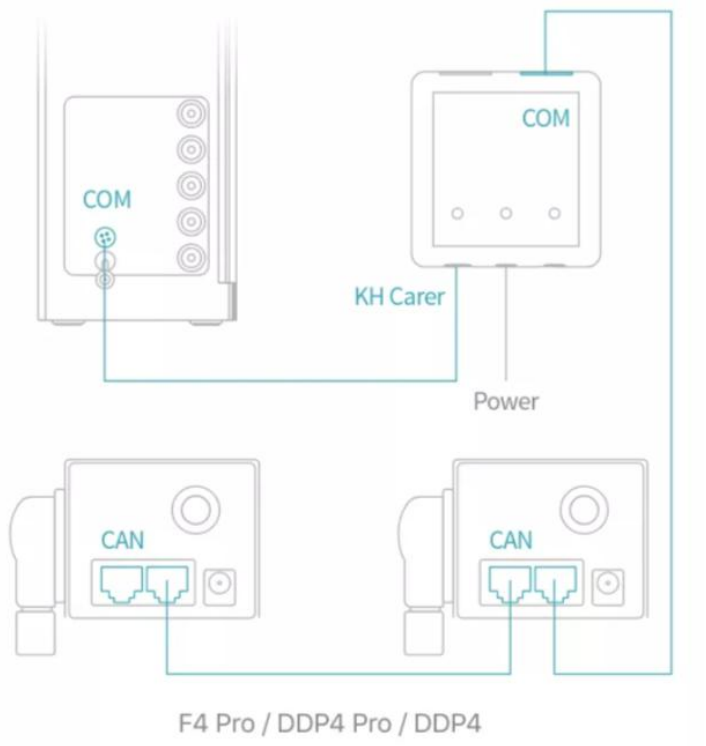
Plan 1 The amount added: 20 - 5 = 15

Plan 2 The amount added: 10 – 5 = 5

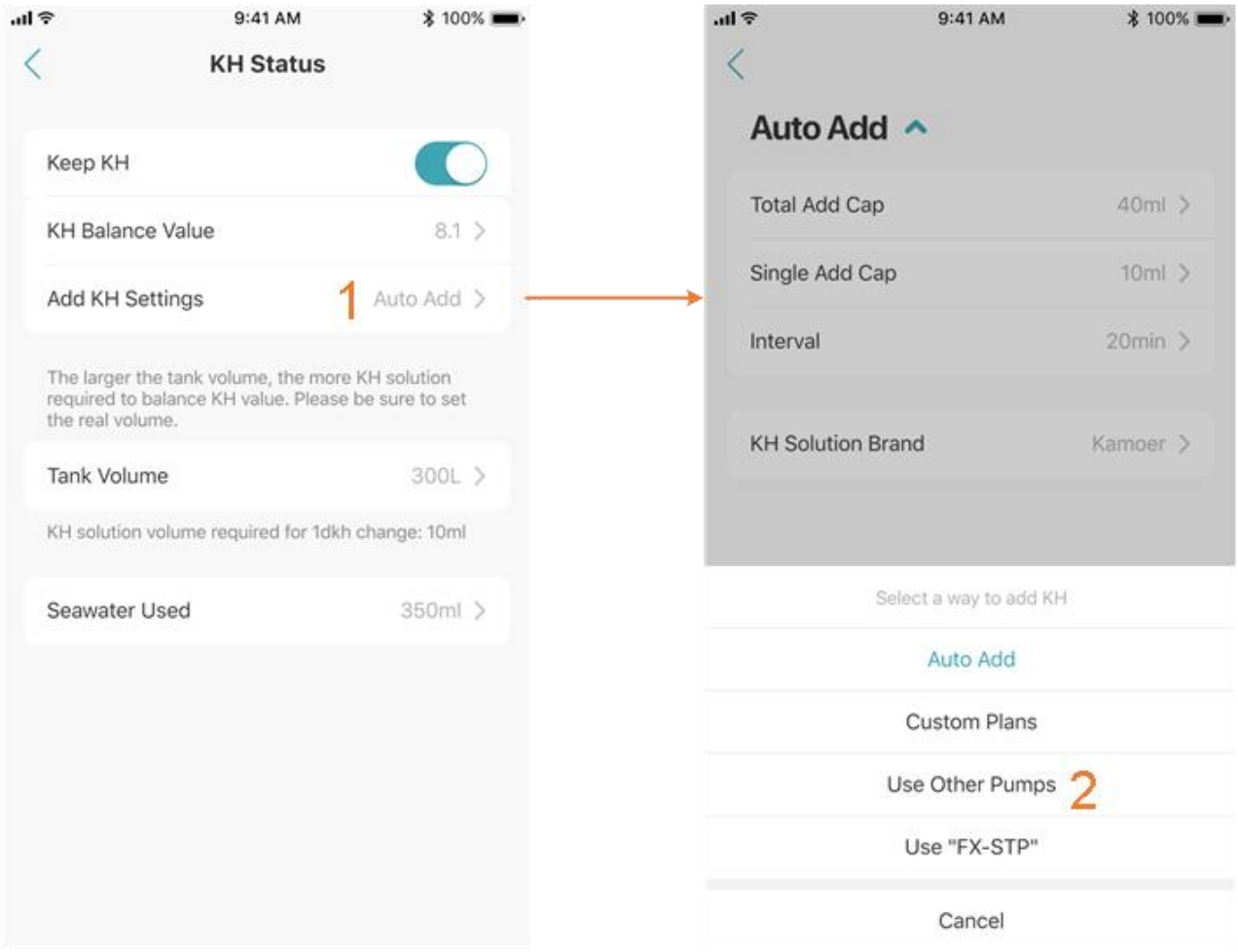
Plan 3 The amount added: 4 – 5 = -1 (Dose not run)

3.10 Use Other Pumps to add

- The use of other pumps refers to the use of F4 PRO, DDP4, DDP4 PRO and other KH Care pumps other than KH Care to adjust KH, generally used in the adjustment of KH when adjusting multiple elements
- It is necessary to use the KH Carer E1 expansion module to connect KH Carer and the external titration pump, and connect the titration pump according to the connection scheme shown below
- The picture shows the connection diagram of KH Care, KH Carer E1 and F4 PRRO titration pumps, the same applies to DDP4, DDP4 PRO

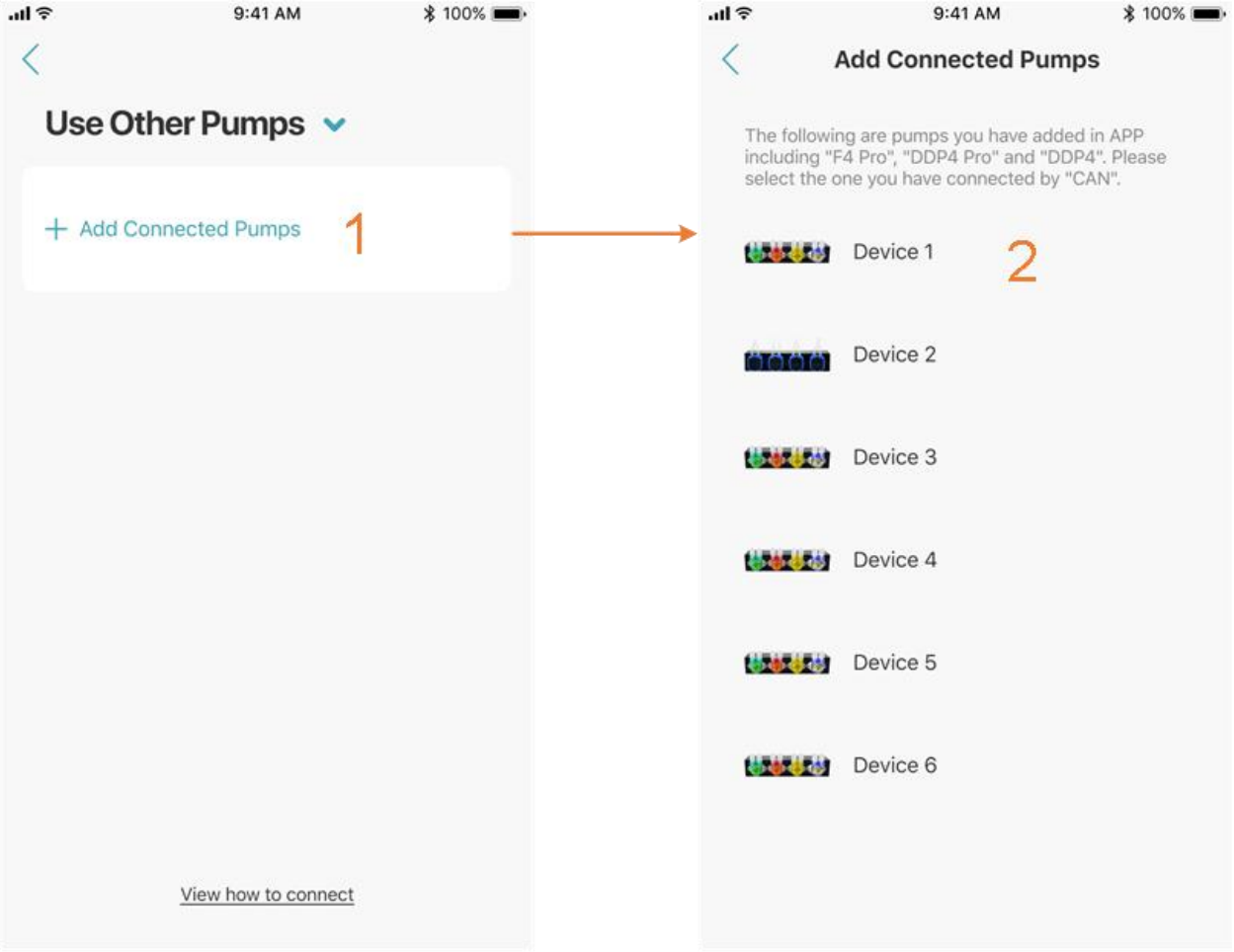


F4 Pro / DDP4 Pro / DDP4

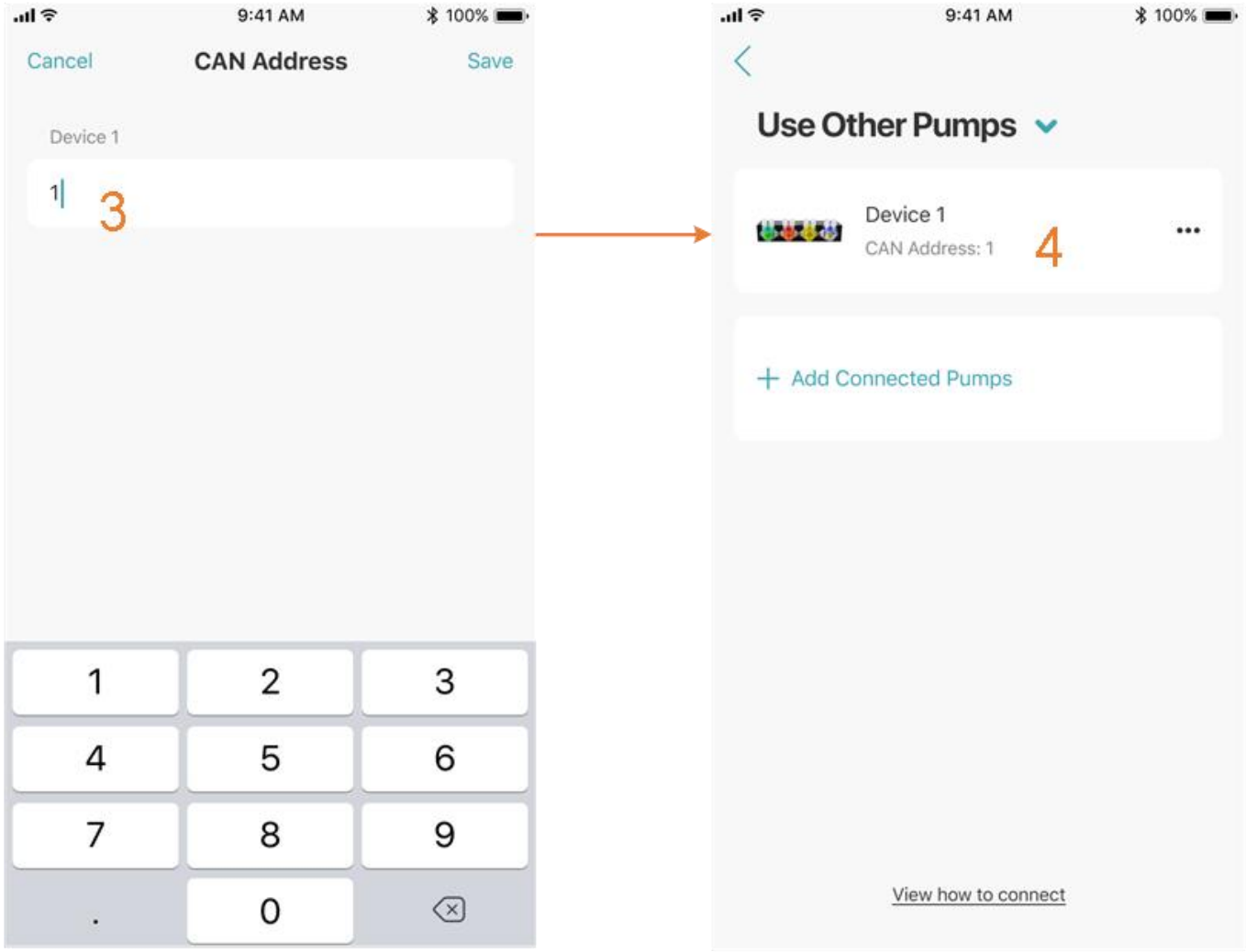


1. From the home page status module → Keep KH → add KH mode settings, enter the KH booster add setting function interface
2. Select Add using other pump methods to enter the Add using other pump function interface

After connecting KH Carer and the titration pump as described above, the software needs to configure them for linkage as follows:

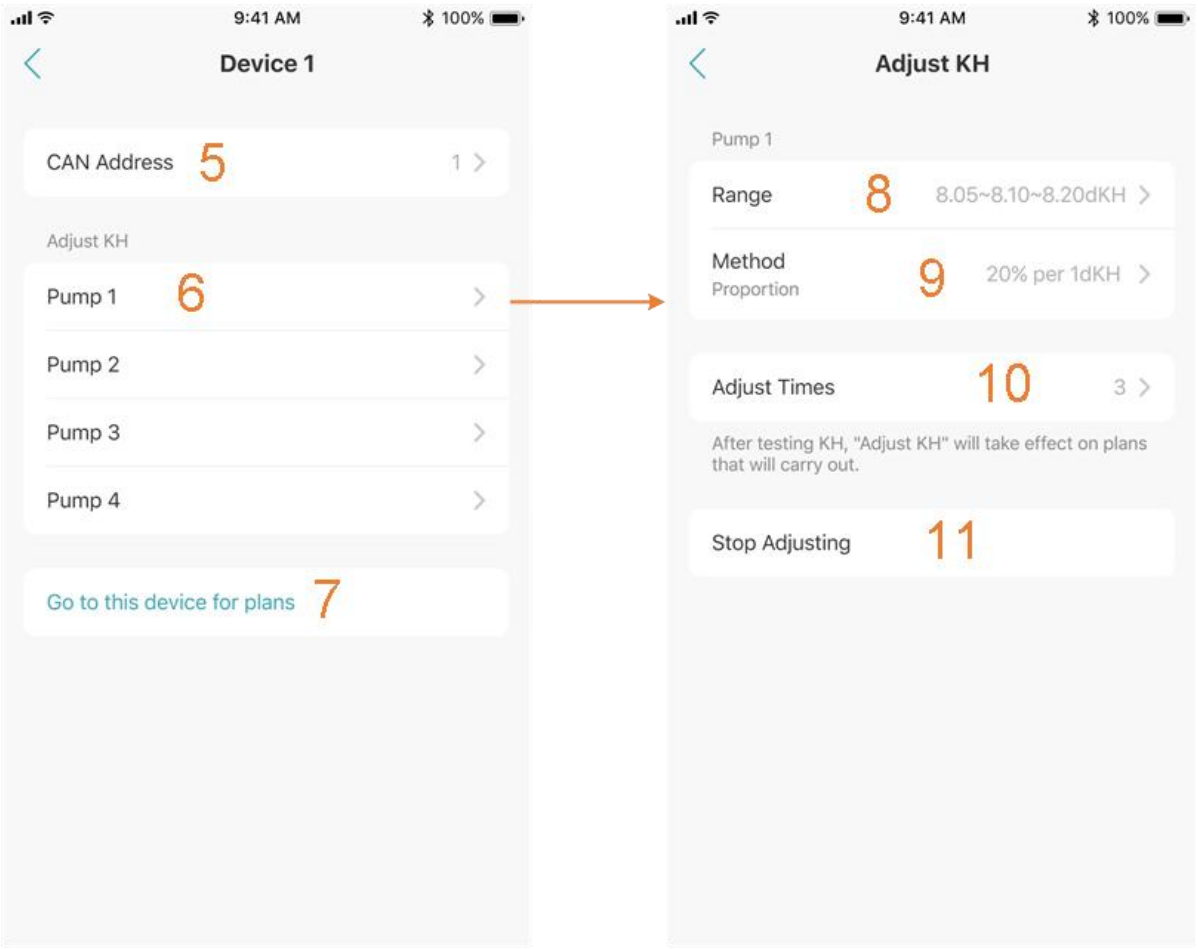


1. Add a pump connected via a wire
2. Through the WIFI pump that has been bound to the Kamoer Remote App, select the pump that needs to be wired linked, and click to enter



3. The wired communication address of the equipment pump, if you want to bind multiple pumps, the address of each pump should be different

4. The pump with successful wired binding can click to enter and set the parameters

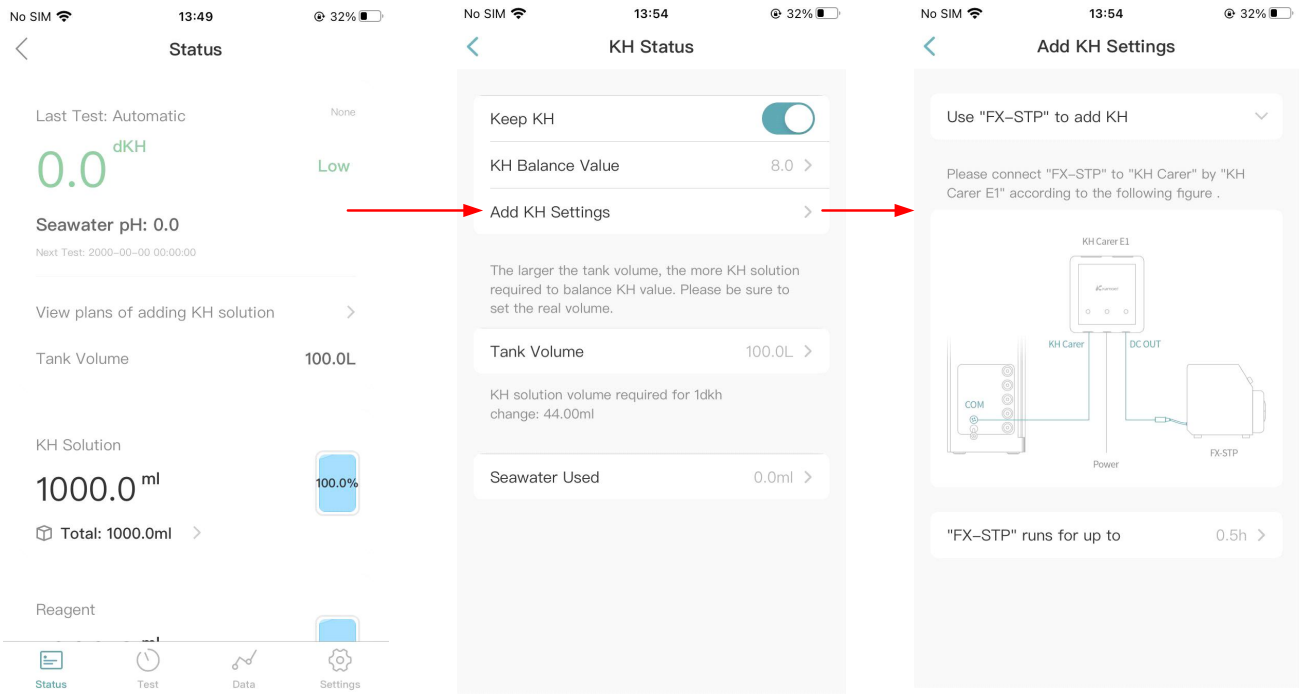


5. Wired communication address, set at binding time
6. The pump head of the titration pump, click to enter to set the KH lifting agent adjustment method and adjustment amount of the pump
7. Click to set the titration plan for the pump head of the titration pump
8. Adjustment range, 8.05~8.10~8.20, 8.05 and 8.20 in the figure above represent the upper and lower limit ranges, KH detection value in this range KH Carer will control KH lifting reagent pump for KH adjustment, KH detection value if beyond this range, need the user to manually adjust the KH value. The middle 8.10 is the target balance value.
9. There are two ways to adjust the titration plan, one is to adjust according to the proportion and the other is to adjust according to the quantity
10. Number of impact plans: Adjust the number of plans affected by KH value from the completion of detecting KH value
11. Stop the adjustment, stop the execution of the adjustment plan after stopping this KH test, and perform the adjustment if it is necessary to adjust after the next KH test

3.11 Connection of Calcium anti-control Module

When the KH value is low, KH can be supplemented by calcium inverse:

1. Go to the status page, select the recent detection area, and click Add KH setting to enter the connection interface.
2. When the KH detection value is low, KH Carer controls the calcium counter pump to turn on through the KH Carer E1 module, and the next time KH Carer tests that the KH value is normal, KH Carer controls the calcium counter pump to turn off through the KH Carer E1 module.
3. The rate of supplemented KH can be adjusted by adjusting the speed of calcium anti-KH, in order to prevent calcium anti-KH overdose, the maximum running time of the calcium anti-pump can be set in the App.



3.12 KH Carer E1 Interface

The above picture shows the actual connection diagram of KH Carer, KH Carer E1 module and calcium dosing pump

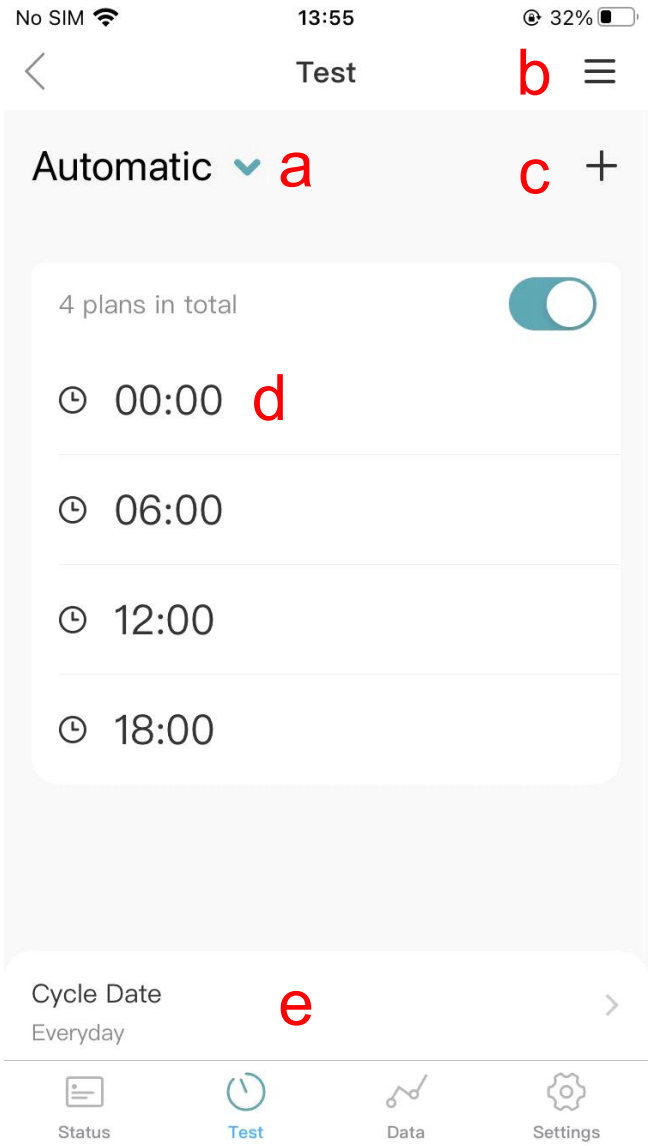
1. Calcium dosing pump, set to power-on operation in actual use
2. KH Carer E1 Calcium Counter Control Module
3. The power output of KH Carer E1, connected to the calcium dosing pump
4. KH Carer E1 is connected to the power adapter of the calcium dosing pump, and the supported voltages are 12V and 24V
5. KH Carer E1 signal line, connect to KH Carer
6. KH Carer device

⚠**Note:**

The voltage supported by the KH Carer E1 power input voltage is 12V or 24V DC, do not connect 110V~ 220V AC power supply.

3.13 Automatic Detection

In the automatic detection function mode, you can set a schedule for automatic detection, and the device will perform automatic detection according to the scheduled time. Before automatic detection, manual detection is required to verify the accuracy of detecting KH value.



a. Auto-detect:
Switch to auto-detect mode here

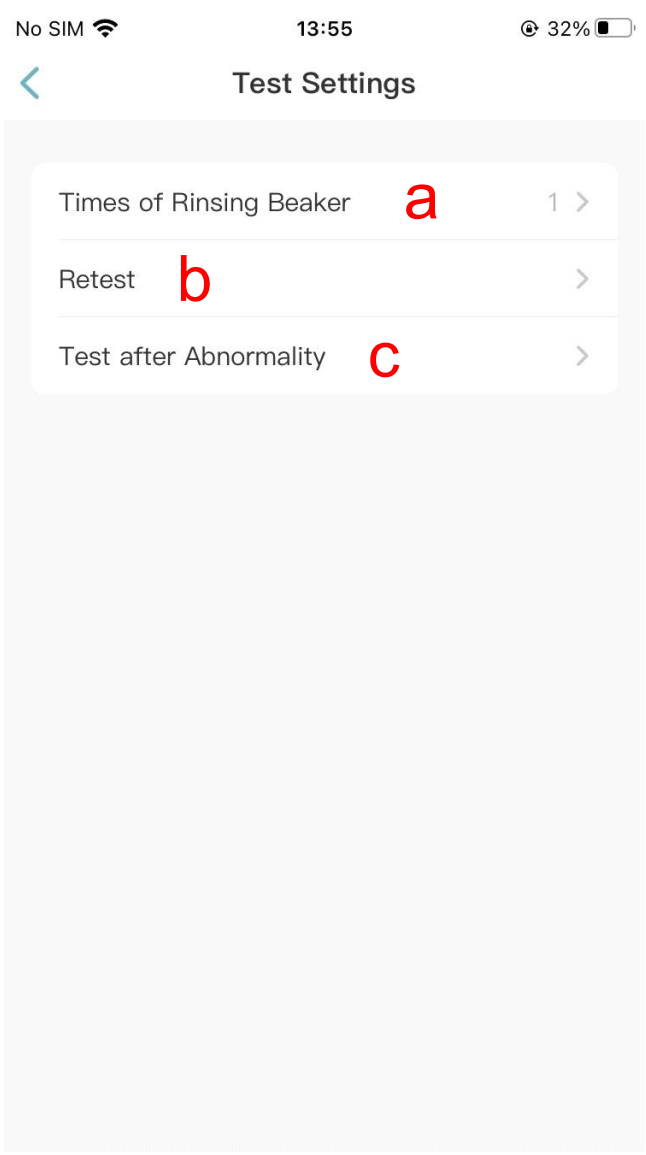
b. Auto-detect switch:
Here you can turn auto-detection on and off

c. Add a plan:
Click to enter the add plan interface, the parameter to be entered to add a plan is the plan start time

d. Created plan:
KH detection will perform automatic KH detection according to this time

e. Cycle date:
The cycle time of the detection, which can be detected once every few days, or once every week

3.14 Automatic Detection of Parameter Settings



a. Times of Rinsing Beaker:
Before each equipment test, the seawater will be automatically extracted to rinse the beaker to reduce the influence of the remaining liquid last time.

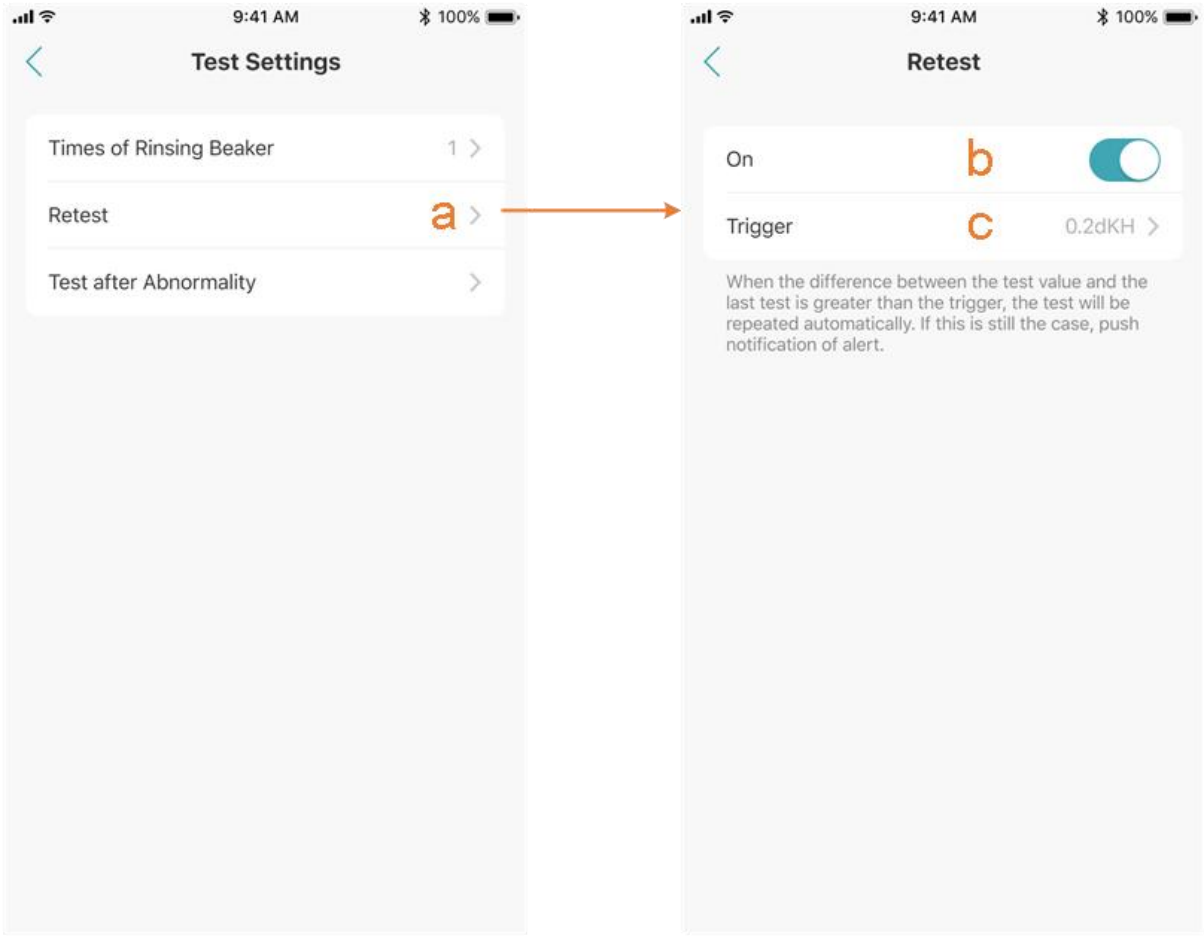
b. Retest:
When this function is turned on, when the difference between the test value and the last test value is large, the device will immediately test again. If the value detected again is indeed different from the previous test value, the latest value of the repeated test shall prevail.

c. Test after Abnormality:
When this function is turned on, when the detection value exceeds the set threshold, the KH Carer will speed up the detection frequency, such as once every 2 hours.

3.15 Duplicate Detection Function

The repeat detection function is in the automatic detection mode, when the difference between the KH detection value and the previous detection value is too large, it will trigger a repeat detection to confirm whether the KH value is abnormal, and this difference can be customized by the user.

- In the process of using the equipment, sometimes due to temporary bubbles in the tube, resulting in measurement errors, in order to avoid these potential measurement errors caused by the execution of wrong actions (such as too much KH enhancer reagent), the equipment will compare the new KH detection value with the previous KH detection value.
- If the error is greater than one value, a retest is triggered to ensure safety.
- The measurement error may also be real, such as a test after a long interval, or the KH enhancer reagent may have just been replenished in the tank.
- In the automatic mode planning interface - > the upper right corner of the > Repeat Detection - Set, enter the duplicate detection parameter setting interface



a. Click Duplicate Detection to enter the Duplicate Detection parameter setting interface

b. Repeat detection function switch, turn on the switch to take effect, when the KH detection value exceeds the last KH detection value within a certain range, trigger the repeat detection, turn off the switch will not perform this function

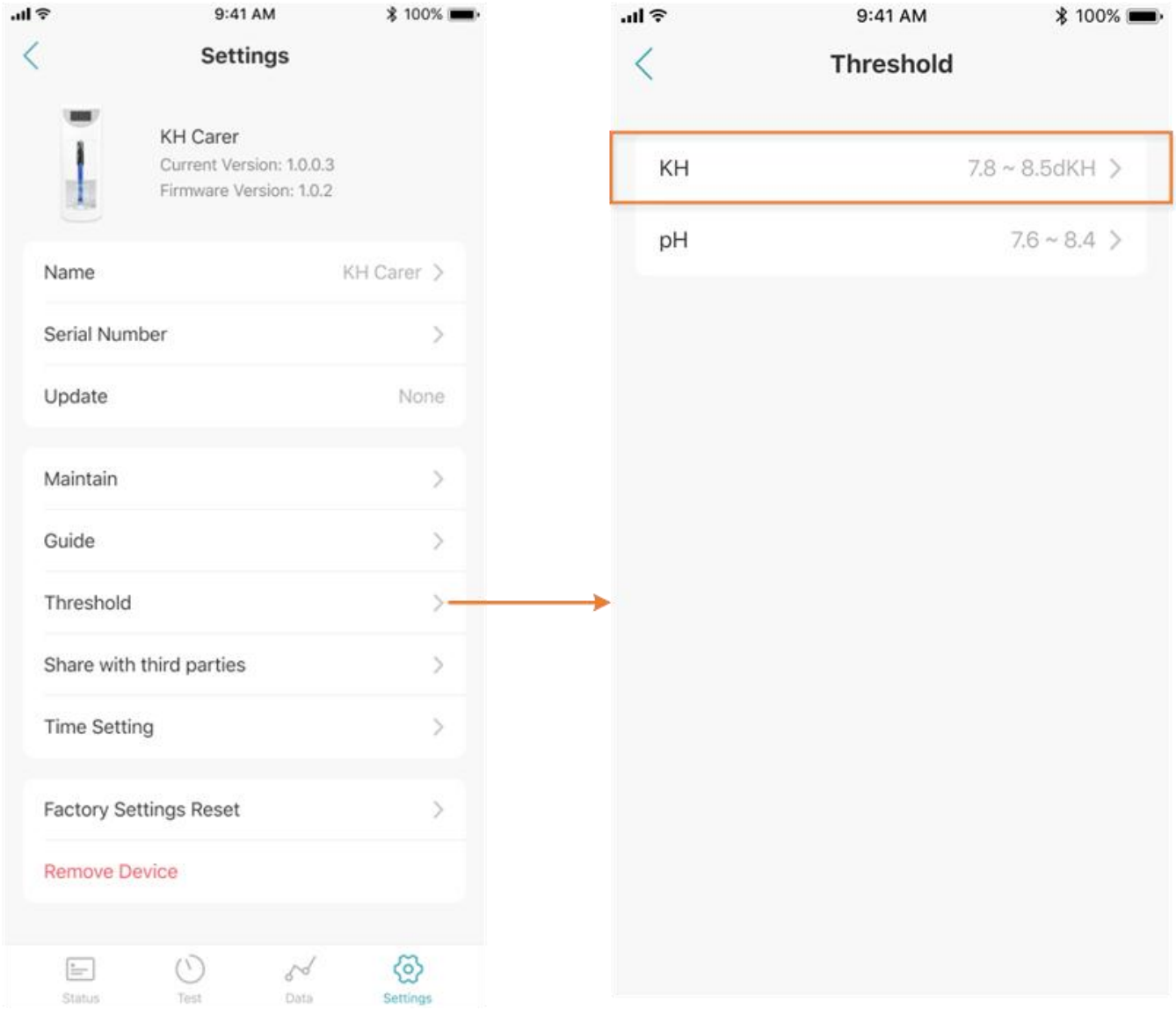
c. Trigger value, when the KH detection value exceeds the range of the trigger value ± the last KH detection value, a repeat test will be triggered

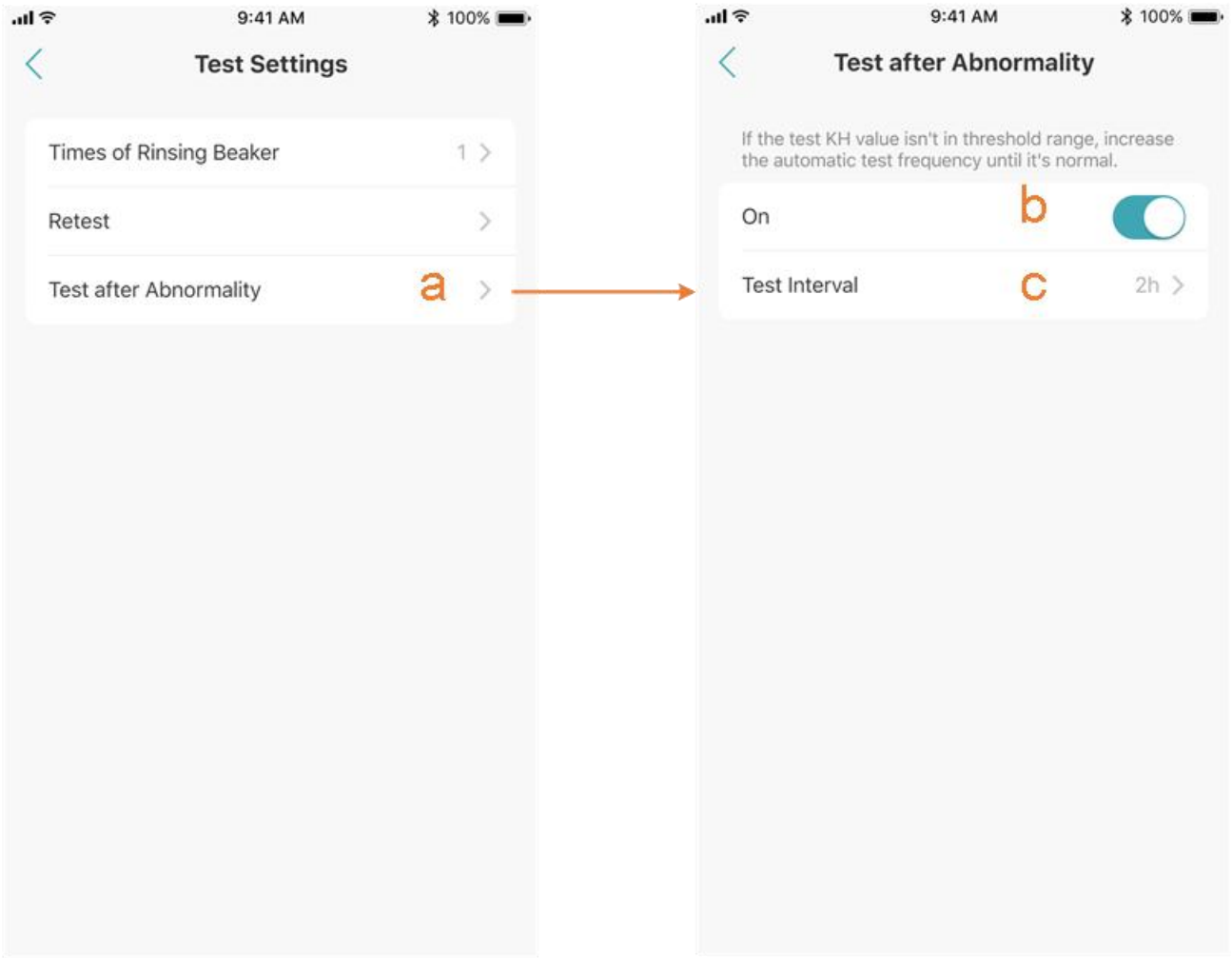
If you do not want this function, such as using the machine, using a very low frequency test, the KH value of the two tests differs by more than 0.2dKH, or knowing in advance that the next measurement will differ by more than 0.2dKH from the previous measurement, you can turn off this function. With this feature, we recommend measuring at least 1 time every 6 hours.

3.16 Post-anomaly Detection

If the post-abnormality detection function is enabled, when the KH detection value exceeds the range of the KH high and low alarm threshold, the device will detect KH at a higher detection frequency until the detection value returns to the KH high and low alarm threshold range.

- The high and low thresholds of the alarm are set in System Settings → Threshold → KH
- This function is generally used in situations where parameters need to be adjusted by KH value, such as opening the calcium counter pump by detecting the KH value, and turning off the calcium counter pump when the next KH value detection is appropriate.





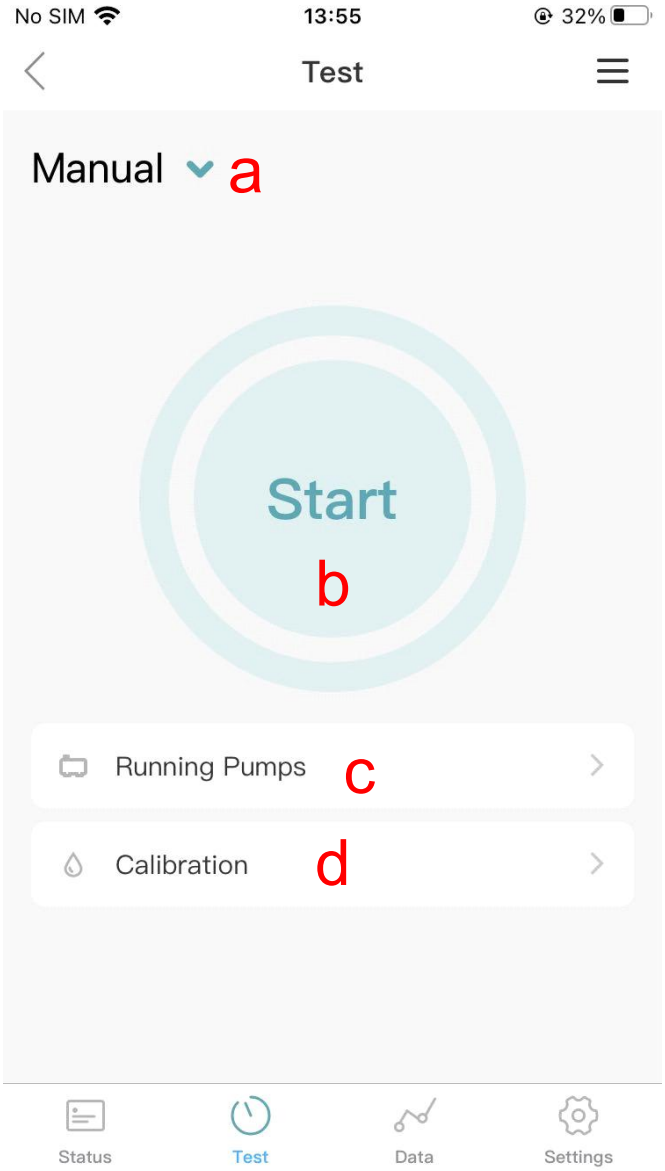
a. Click the Detect Parameter Settings screen after typing the exception

b. Turn on the post-abnormality detection switch, when the KH detection value exceeds the set high and low thresholds, the KH detection frequency will be accelerated until the KH detection value returns to the high and low thresholds

c. Detection frequency, after the KH detection value is abnormal, speed up the frequency of detection

3.17 Manual Detection

The manual module can perform manual KH detection and can calibrate sensors and pumps. Calibration and manual testing of sensors and pumps is necessary until the equipment is stabilized.



a. Manual mode: switch between manual and automatic mode here
b. Start manual detection: start a manual KH detection
c. Running the pump: manually run each pump, which can be used when debugging the equipment
d. Calibration : calibrate the pump head and sensor, here can also calibrate KH

3.18 Data Module

The data module can view the historical data of KH detection

a. KH History Chart

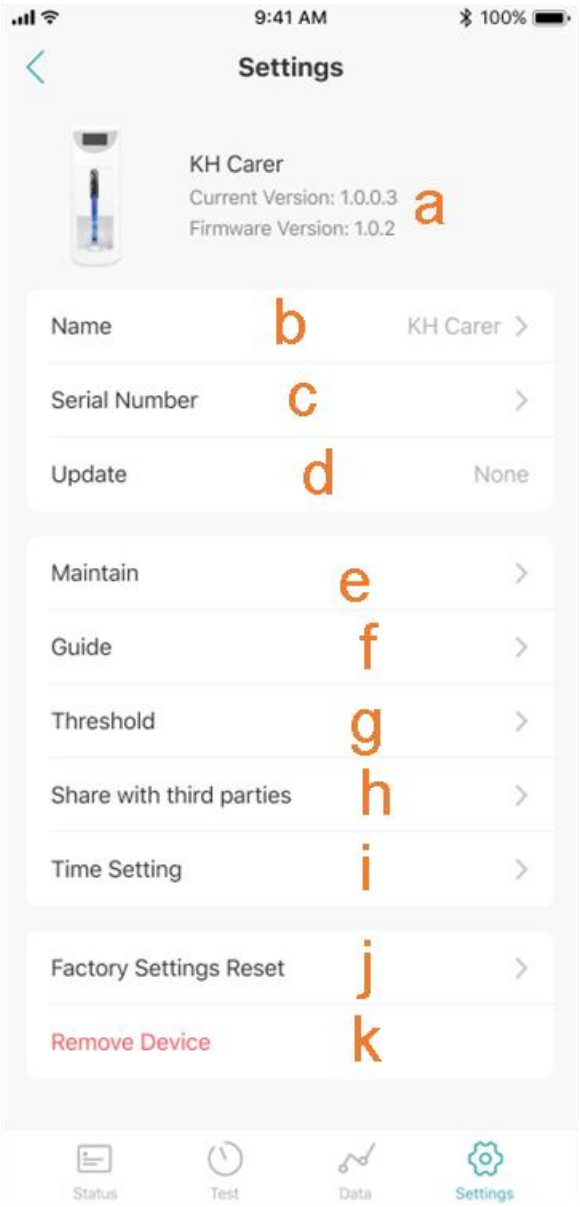
b. pH History Chart

c. View data cycle:
View data for one week or one month;

d. Deadline for viewing data:
Set the deadline, the data displayed on the chart is the data before the deadline;

e. Data list:
The data list displays the detailed information of KH historical data, including time, KH value, amount of KH reagent added, and detection mode;

3.19 Settings Page



a. **Device firmware version information**

b. **Device name:** The setting and modification of the device name;

c. **Serial number:** Here you can view the serial number of the device;

d. **Firmware upgrade:** Upgrade the device firmware here, when there is a firmware update, the red status here shows the latest firmware version

e. **Maintain:** Individual operation and maintenance of each pump, setting maintenance of magnetic stirring, calibration of pumps, calibration of pH electrodes, etc. are carried out here

f. **Use guide:** Guide the user to do the settings after getting the device for the first time

g. **Threshold:** Set the high and low thresholds of KH and pH here. When the detected value exceeds this range, the device will push an alarm to the App.

h. **Share with third parties:** Sharing KH Carer test data with third-party devices requires the third party to develop programs in accordance with the Kamoer development platform protocol

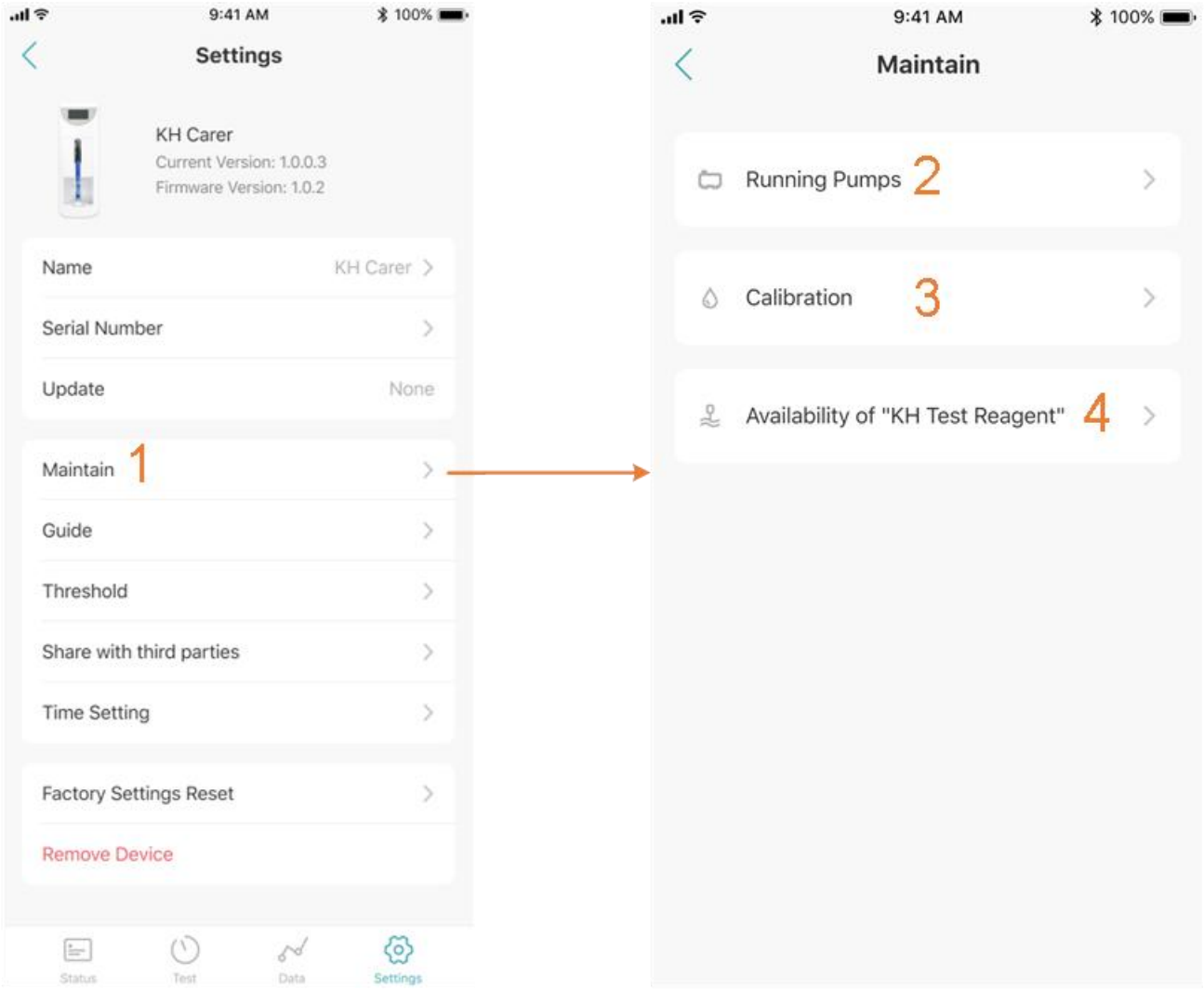
i. **Time setting:** Set the real-time clock time of the firmware to ensure the correct execution of the pump dosing plan;

j. **Factory Settings Reset:** Click on restore factory settings, after restoring factory settings, the parameters of the device will be restored to the factory state;

k. **Remove device:** Click to unbind the App and the device

3.20 Maintain

The maintenance module includes the setting and maintenance of magnetic stirring, the operation of each peristaltic pump, the filling and removal of liquids, the calibration of peristaltic pumps, the calibration of pH electrodes, etc., to help maintain KH Carer, which can be accessed from the settings interface.

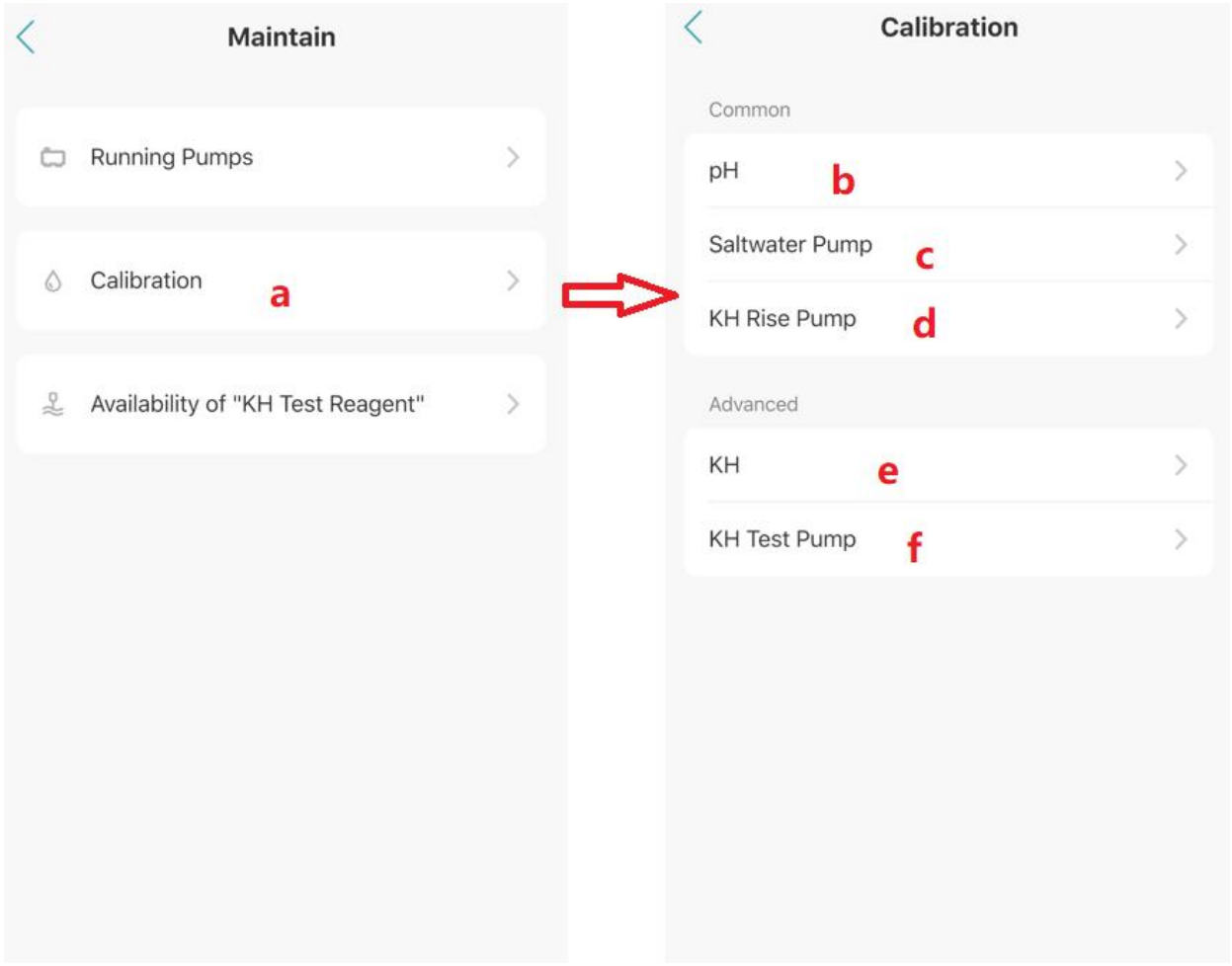


1. Click to enter the maintain page
2. Run the pump, where you can run each peristaltic pump and magnetic stirrer pump, which is convenient for temporarily filling pipelines, troubleshooting problems, setting magnetic stirring strength, etc.
3. Here, the detection reagent pump, seawater pump, pH electrode, KH booster pump, etc. can be calibrated, and the KH value can also be corrected, please refer to the App guide for specific operations
4. KH detection reagent verification, please refer to the App guide for specific operations

3.21 Calibration

Equipment maintenance process needs to regularly calibrate some components to ensure the accuracy of the test, commonly used calibration is pH calibration, pumping sea pump calibration, KH enhancer pump calibration.

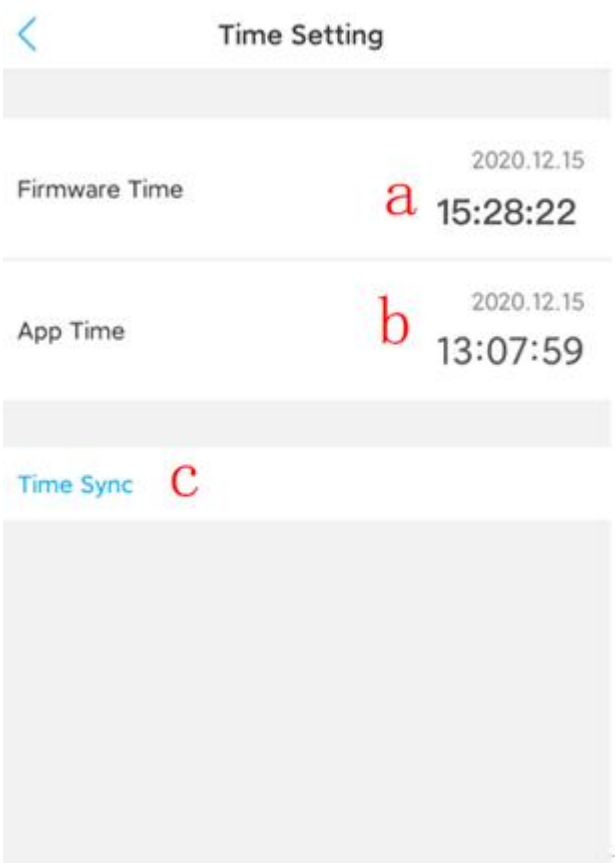
KH enhancer reagent calibration is calibrated at the factory, only after restoring the factory settings need to calibrate, other times do not need to calibrate

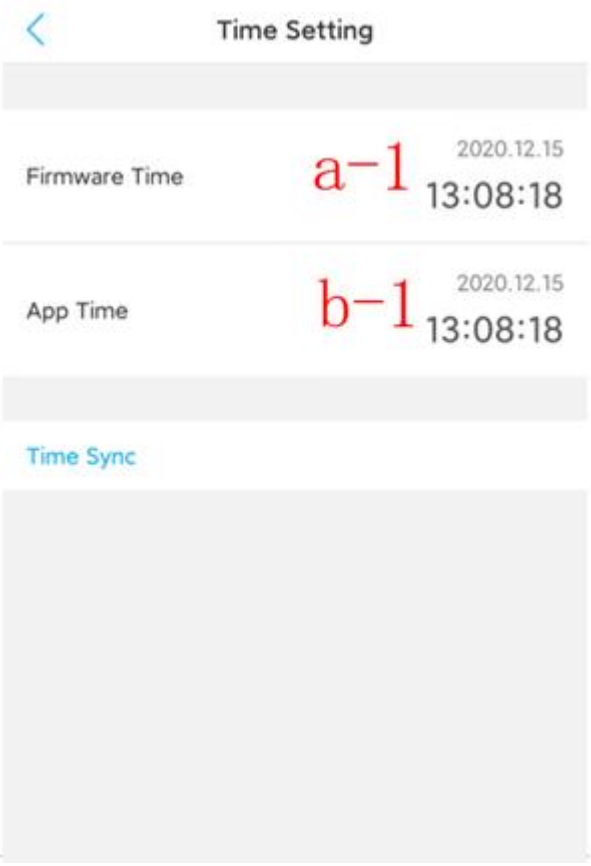


a. Click Calibration to enter the calibration function interface
b. Click to enter the pH calibration interface and follow the App prompts
c. Click to enter the calibration interface of the pumping seawater pump and follow the App prompts
d. Click to enter the KH lifting reagent pump calibration, and follow the App prompts
e. KH value correction, the function of correcting the KH Carer measurement value to the same as other measurement methods
f. Click to enter the KH detection reagent pump calibration, the KH detection reagent pump has been calibrated at the factory, no need to recalibrate, and recalibration is required after restoring the factory setting

3.22 Time Setting

When the time of the device does not match the local time, it is necessary to synchronize the real-time clock time of the device through the App to ensure the normal execution of the device dosing plan;



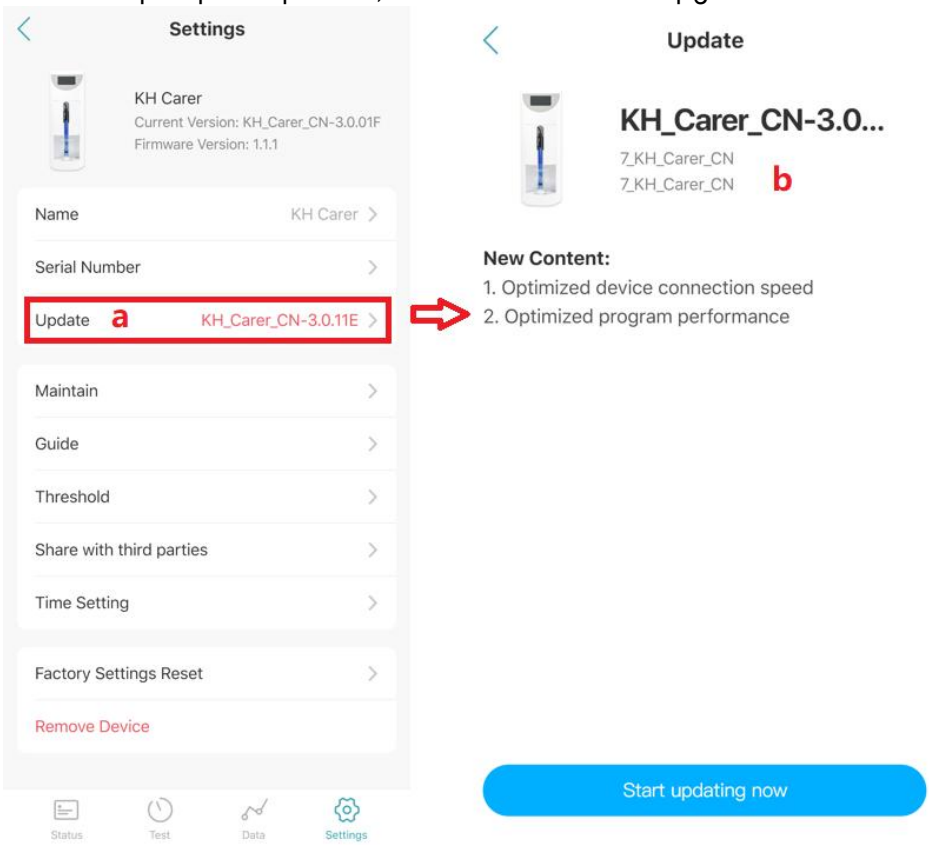


a. **Firmware time**: the current real time clock time of the device;
b. **App time**: the current time of the phone;
c. **Time synchronization**: Click to start the device time synchronization, after the time synchronization, the running time of the device will be the same as the time of the mobile phone;

a-1, b-1 are the real-time clock time of the device and the mobile phone time after time synchronization;

3.23 Firmware Upgrade

When the firmware of the pump is updated, the user needs to upgrade the firmware to use it.



a-1) If the latest firmware can be upgraded, the latest version number is displayed here: you can click to enter the upgrade process

a-2) If the latest firmware is not available, it is displayed here: it is the latest version

b) New version prompt: the new version information is displayed, and the new version description is displayed below

c) Click Update Firmware Program: the status is displayed after the firmware update is completed;

The upgrade operation steps are as follows:

Enter the App setting interface, if a new firmware version is found, click the c update button to update the firmware, do not perform other operations at this time, do not exit the App or re-enter the App , wait until After the device is upgraded, normal operations can be performed. If the upgrade fails, please repeat the upgrade steps.

After the device is upgraded, you can perform normal operations. If the upgrade fails, repeat the upgrade steps.

Note: Do not power off during the upgrade process, and the App should not perform other operations during the upgrade process.

Equipment Maintenance

4. Equipment Maintenance

4.1 Suggestion

- Clean the inlet of the sample pump tube regularly, place the blockage, and affect the extraction of the sample
- The pH electrode is calibrated regularly (every 4 weeks), and the pH is stored in the solution after use, and in the case of long-term non-use, the pH electrode should be stored with an electrode cap with protective solution
- After recalibrating, check whether the value is accurate
- Shake the KH detection reagent well every week to ensure the uniform concentration of KH detection reagent
- Use at room temperature at 20 ° C~30 ° C room temperature

4.2 Measurement Accuracy

KH Carer offers the best possible accuracy for this type of measuring device. During lengthy and time-consuming trials, the measuring process, the measurement electronics and mechanical design have been optimized to such an extent that KH Carer can provide very precise measurement results.

However, small measuring tolerances, which are present in all measuring devices, cannot be completely avoided.

As a user, you can do something necessary to achieve the best measurement accuracy

4.3 KH Carer can improve accuracy by doing the following

- Seawater sample volume pump calibration, water sample volume (50ml)
- Carefully calibrate the pH electrode regularly (approximately every 4 weeks)
- Shake the KH detection reagent every week to ensure that the concentration of KH detection reagent is uniform
- When the waste liquid pipe is installed, the waste liquid pipe should contact the bottom of the beaker to ensure that the waste liquid can be completely discharged before each test

Under these optimal conditions, an error of about 0.1 dKH can be achieved. If all optimal conditions are not met (e.g., less reagent consumed due to smaller sample volumes), tolerance becomes slightly higher, typically to about 0.3 dKH. In any case, the measured value resolution is 0.1 dKH

4.4 Handling of errors generated during actual measurements

- Daily KH fluctuations of 2 ° dKH or more are not uncommon and usually do not cause harm. However, exceeding or falling below the optimal range is likely to be harmful.
- When controlling the KH value, it is not important to be sure of a certain value, on the contrary, care should be taken to ensure that the KH value is toggled within the optimal range.

4.5 Prompt Sensor Troubleshooting

1) Check the detection reagent barrel

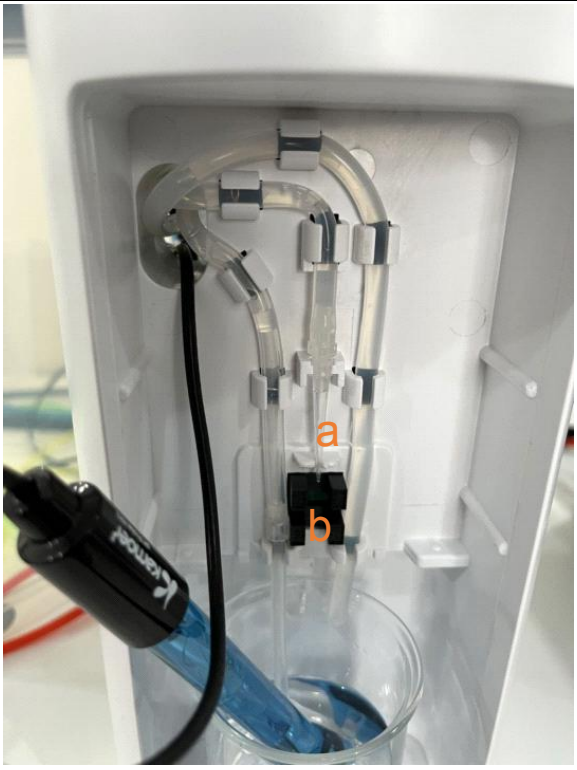
- Check whether the KH test reagent bucket is empty
- The KH detection reagent pump tube does not penetrate below the KH detection reagent level

2) Detect whether there are bubbles in the reagent pipeline

The causes of air bubbles in the pipeline are as follows

- When the KH detection reagent is replaced, the pump tube enters the air, and it is necessary to run the filling function of the detection reagent pump to eliminate air bubbles
- The KH detection reagent pipeline joint is loose, which may be loose due to transportation reasons or vibration, and the Luer joint needs to be tightened

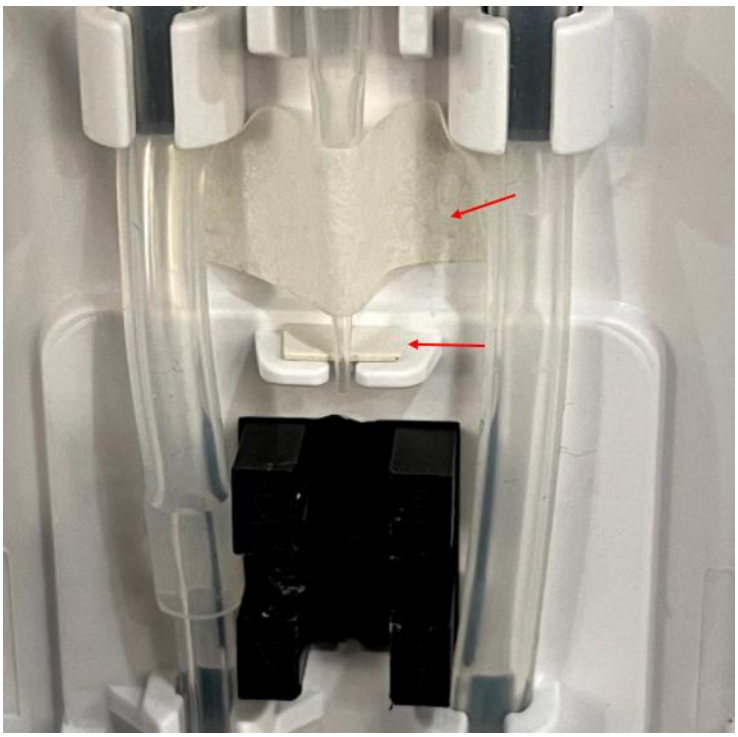
- In the figure above, a is the detection reagent pump connector, and the pump tube coming out through the interface a is the detection reagent pump tube
- The inlet should be submerged in the detection solution and should not float above the liquid
- The pipeline is damaged, replace the pump pipe
- Whether the installation of the detection reagent dripper is appropriate, the figure below is the installation and troubleshooting introduction of the detection reagent dripper



- In the left figure, "a" is the detection reagent pump dropper, and "b" is the photoelectric sensor
- In the event of a dropper sensor failure, check whether the dropper head "a" is in the tank, and if it is not in the tank, it is placed back in position
- Check whether there is liquid hanging on the photoelectric sensor "b", if there is liquid hanging liquid, wipe the hanging liquid clean and use it again

3) Check to see if the position of the detection agent drip is offset

Due to the vibration of transportation, the stretching of the hose, etc., the position of the dripper may be offset, and if a sensor failure occurs, it is necessary to assist in locating the position of the dripper.



When the position of the test reagent pump dropper is offset, try the following treatment:

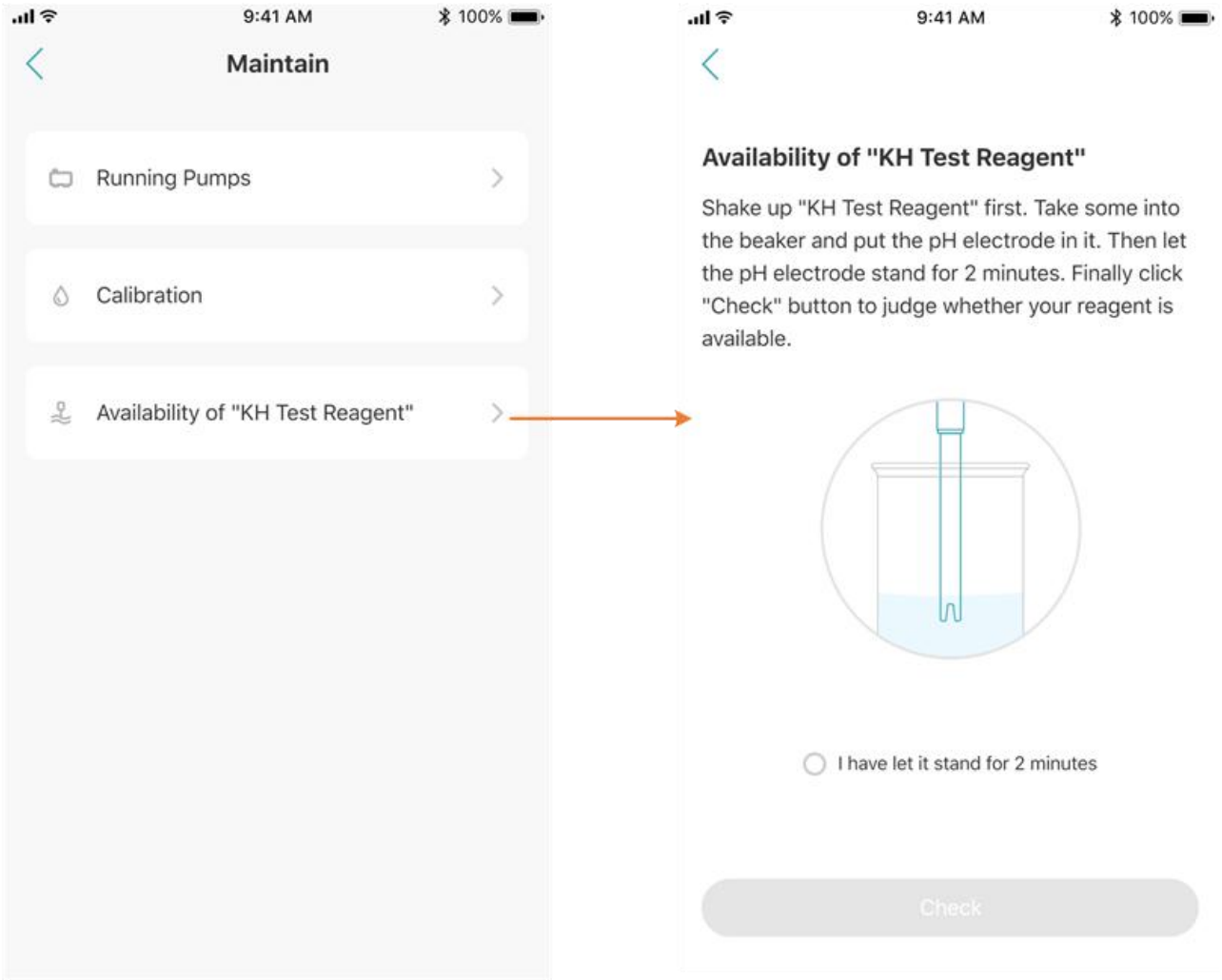
- Use tape to secure the dripper to prevent the dripper from deflecting outward
- Using a piece of paper placed behind the dripper, push the dripper outward about 1 mm

Note: The new version of the machine already has a fixed tape and a suitable dripping head distance, and generally does not need to do the above treatment

4.6 Large Detection Values (more than 15 dKH)

1) Check whether the KH detection reagent is required for composite use, you can check whether the KH detection reagent meets the use needs in Settings → Maintenance→ KH Detection Reagent Maintenance, and refer to the App instructions for specific operations

2) In Settings → Maintenance → Calibration
Re-follow the instructions of the App, calibrate the pH electrode, and pump the sea pump



3) Whether the pH electrode is placed in the correct position, and whether the magnetic stirrer can rotate normally

- After the pH electrode extracts the seawater sample, the pH electrode head can be immersed in the liquid like the figure on the left, which does not affect the operation of the magnetic stirrer, if not in this position, the electrode can be adjusted up and down to reach a suitable position
- When the magnetic stirrer is running, it can run roughly around a center, smooth operation, will not rotate, if the magnetic stirrer does not rotate, or rotates randomly, it will affect the KH detection value. It can reduce the running strength of the magnetic stirrer, generally below 50%.

Appendix

5. Appendix

5.1 Technical Parameters

Dimensions (LxWxH)	230x120x338 mm
Weight	2935 grams (without power adapter)
Power Adapter	Input：100VAC -240VAC Output：DC 24V 2A
Interface	WIFI, Bluetooth, CAN (for backup)
Working Environment	temperature 0~70 ℃, humidity 10%~ 90% (non-condensing)
Storage Environment	Temperature -20 ℃~ 85 ℃, humidity 10%~90% (non-condensing)

5.2 After-sales Warranty Information

1. Warranty Conditions

The free service during the warranty period is only valid under normal use and maintenance according to the user manual, and all man-made faults or damages are not covered by the warranty. Users, please keep the purchase invoice and user manual properly, so that you can obtain satisfactory after-sales service in a timely manner.

2. Warranty

Within one year from the date of purchase, if there is any damage caused by the manufacturing process or components, the company will provide free warranty service.

The free maintenance service provided during the warranty period includes free repair, free replacement and replacement of faulty parts, and products that cannot be repaired are replaced with products of the same model (the model has been discontinued, and the model is similar to it). Free service does not include shipping costs for product repairs.

3. Non-warranty coverage

The following factors are not covered by the free warranty, and customer repairs are subject to fees.

1) Product appearance (please confirm when purchasing);

2) Improper use, maintenance or storage (please use, maintain and store correctly according to the user manual);

3) Access to inappropriate power supply;

4) Damage to the components caused by the short circuit of the circuit board caused by various insects entering the machine;

5) Losses caused by accidents;

6) Use inappropriate spare parts (non-company spare parts are not applicable);

7) Persons not authorized by the company negligently handle, modify or repair (please do not dismantle or repair without authorization);

8) Failure or damage caused by use outside the applicable occasion;

9) Damage caused by force majeure, etc.;

10) Consumable and wearing parts (such as pH electrode, ORP electrode, etc.);

11) The warranty period has expired.