tQ01-X2 Fluorometer

User Manual

V.0603

For Research Use Only. Not for use in diagnostic purpose.

Please read this manual carefully before using the instrument and fully understand the precautions.

CONTENTS

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SAFETY INFORMATION

- Please read and fully understand the following safety precautions.
- Please operate the instrument strictly in accordance with the operating instructions of this user manual to ensure safety.
- The safety instructions in the user manual are explained. The operations or matters shown in ***"WARNING"***,***"CAUTION"***and ***"NOTE"***may cause danger or problems to the experiment, so be sure to pay attention to the operations.
- Please do not operate the instrument in any manner that is not instructed or described in the operation manual. If you have any problems with use, please contact the supplier.
- The descriptions in this manual try to cover all possible operational risk indications. But beware of the unexpected. Please proceed with caution.

WARNING

- *Operation: Operators are not allowed to disassemble the plastic shell of the instrument, replace components or perform internal adjustments, and it is strictly forbidden to disassemble the instrument while the power is on. If necessary, please contact a professional after-sales engineer for instrument maintenance and repair.*
- *Power cord: This instrument usually uses the supplied power cord. If the power cord is damaged, it must be replaced with a power cord of the same type and specification. During use, the power cord should be kept away from places where people flow to avoid loosening. When plugging and unplugging the power cord, be sure to hold the operating part of the plug correctly. Do not pull or pull the power cord hard.*
- *Placement of the instrument: Do not place the instrument where it is difficult to cut off the power supply. The instrument should be placed in a place with low humidity, less dust and away from water sources (pools, water pipes, etc.). The laboratory should be well ventilated and free from corrosive gases or strong magnetic field interference. Do not place the instrument in a humid or dusty place. The worktable or laboratory table on which the instrument is placed should be stable.*
- *If the ambient temperature is too high, it will affect the test performance of the instrument and even cause the instrument to malfunction. When using this instrument, it should be kept away from heating, furnaces and other heat sources. Do not use the instrument in places exposed to direct sunlight or strong light, so as not to affect the reliability of the instrument's fluorescence detection.*

- *When the instrument stops working, the power should be turned off. When not in use for a long time, please cut off the power and unplug the power plug, and cover the instrument with a soft cloth to prevent dust and foreign objects from entering.*

CAUTION

*This **CAUTION** indicates that any operation or use, if not strictly followed by the user manual, may result in damage of the instrument or wrong results.*

- *If the following situations occur, please cut off the power immediately, unplug the power cord, and contact the Service Support of supplier:*
- *Liquid spilled/dropped into instrument.*
- *The instrument has been accidentally dropped or the casing has been damaged.*
- *Consumables, reagents and other waste used in the experiment should be properly disposed of in accordance with relevant requirements, and should not be discarded or dumped at will.*
- *After the run, the consumables should be removed from the instrument. Consumables should not be left in the instrument for a long time.*
- *If harmful substances are involved in the experiment, relevant training must be received before use. After use, it must be properly handled and stored in accordance with its instructions for use.*

NOTE：

*This **NOTE** indicates a section or content of special concern, emphasizing common errors in the functionality, operation, or maintenance of the product.*

- *If the following situations occur, please cut off the power immediately, unplug the power cord, and contact the Service Support of supplier:*
- *Liquid spilled/dropped into instrument.*
- *Any abnormal sound or smell appears after the instrument is powered on.*

- *The instrument has been accidentally dropped or the casing has been damaged.*
- *Instrument performance has changed significantly.*
- *The outside of the instrument is exposed to rain or water.*

CHAPTER1 PRODUCT INTRODUCTION

1.1 Instrument Introduction

1.1.1 Description of the Instrument

The tQ01-X2 Fluorometer is a very compact DNA and RNA concentration quantitative detection device, which can obtain highly accurate detection results with only 1~20ul samples. With high detection sensitivity, wide range and short time, it is an ideal detection tool for scientific research laboratories.

Specification of the Instrument

Specification	Parameter
Sample Volume	1~20ul
Sample Throughput	1
Compatible Tube	0.5mL Transparent Thin Wall PCR Tube
Test Time	≤5s/sample
Linearity Range	5 orders of magnitude
Light Source	LED
Excitation Wavelength	Blue 460-480nm,Red 630-650nm
Emission Wavelength	Green500-535nm,Red670-710nm
Detector	SiPMT
Sensitivity	dsDNA 0.01ng/ul、ssDNA0.05ng/ul、RNA0.25ng/ul、microRNA0.05ng/ul
Calibration	2points or 3points

Operation	5 inches Touch screen
Power	DC5V，2A，10W
Working Environment	15-30℃，<75%，Indoor use
Dimension	110*230*45.5mm，0.5Kg

1.2 Features of the Instrument

Rapid Detection----It can accurately detect the sample concentration within 5seconds.

Less Sample Needed----Only need 1-20ul sample to obtain the reliable result.

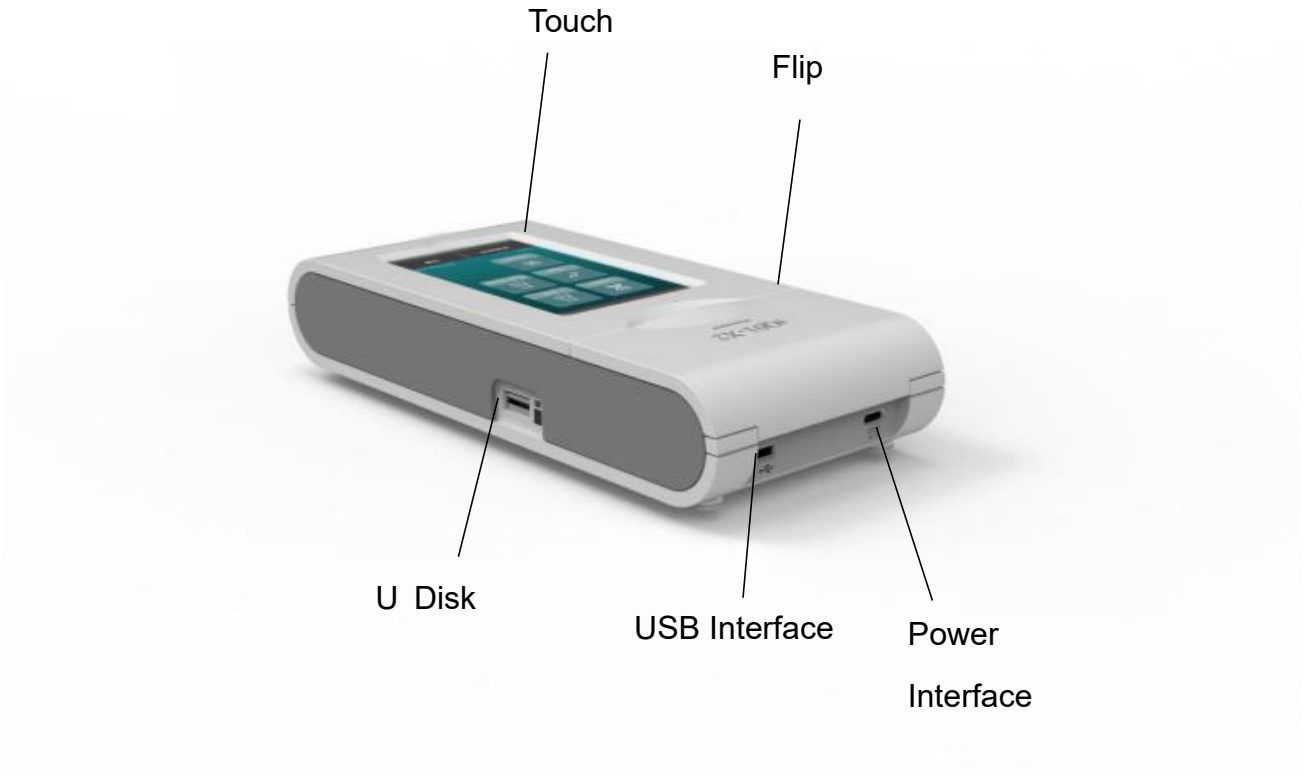
Intuitive Interface----The operation interface design is intuitive and easy to use.

High Accuracy----High detection sensitivity, it is an effective tool for low concentration nucleic acid and protein quantification.

CHAPTER 2 HARDWARE OF THE INSTRUMENT

2.1 Overview of the Instrument

2.1.1 Side View



2.2 Consumables

500ul clear PCR tube

No.	Name	Brand	Item No.
1	0.5ml clear thin wall PCR tube	Axygen/Thermo	Customers purchase by themselves
2	0.5ml clear thin wall PCR tube	Biowe Technology	930001

2.3 Recommended reagents

No.	Name	Factory	Item No.
1	dsDNA HS Quantitative Kit	Thermo Fisher	Q32851
2	dsDNA HS Quantitative Kit	Sangon Biotech	N608301-0100
3	Qubit dsDNA BR Detection Kit	Thermo Fisher	Q32850
4	Qubit ssDNA Detection Kit	Thermo Fisher	Q10212
5	ssDNA Rapid Quantitative Kit	Sangon Biotech	N608302-0100
6	Qubit RNA HS Detection Kit	Thermo Fisher	Q32852
7	RNA Rapid Quantitative Kit	Sangon Biotech	N608303-0100

8	Qubit™ Protein BR Detection Kit	Thermo Fisher	A50668 and A50669

2.3.1 Reagent Description:

1. Thermo Fisher, dsDNA HS Quantification Kit, it contains dsDNA HS Quantification Buffer, dsDNA HS Dye, and dsDNA HS Standard. It enables precise quantification of samples with initial concentrations ranging from 5pg/μL to 100ng/μL. The measurement can be conducted at room temperature, and the signal can remain stable for up to 3 hours. It exhibits good tolerance to common contaminants such as salt, free nucleotides, solvents, detergents, and proteins. To measure sample concentration using this reagent, the dsDNA-dsDNA High Sensitivity function of the tQ01-X2 is required.

2. Sangon Biotech, dsDNA HS Quantification Kit, contains Quantification Buffer and dsDNA Standards. This kit offers high selectivity for double-stranded DNA and enables precise quantification of samples with concentrations ranging from 500pg/μL to 100ng/μL. It also exhibits good tolerance to common contaminants such as salt, free nucleotides, solvents, detergents, and proteins. To measure sample concentration using this reagent, the dsDNA-dsDNA High Sensitivity function of the tQ01-X2 is required.

3. Thermo Fisher, Qubit dsDNA BR Assay Kit, contains dsDNA BR Quantification Buffer, dsDNA BR Dye, and dsDNA BR Standard. It allows precise quantification of samples with initial concentrations ranging from 0.2ng/μL to 2000ng/μL. The measurement can be conducted at room temperature, and the signal can remain stable for up to 3 hours. It exhibits good tolerance to common contaminants such as salt, free nucleotides, solvents, detergents, and proteins. To measure sample concentration using this reagent, the dsDNA-dsDNA Broad Range function of the tQ01-X2 is required.

4. Thermo Fisher, Qubit ssDNA Assay Kit, contains ssDNA Quantification Buffer, ssDNA Dye, and ssDNA Standard. It enables precise quantification of samples with initial concentrations ranging from 50pg/μL to 200ng/μL. The sample amount should be within the range of 1-200ng. The experiment is conducted at room temperature, and the signal

remains stable for 30 minutes. It exhibits good tolerance to common contaminants such as salt, free nucleotides, solvents, detergents, and proteins. To measure sample concentration using this reagent, the Oligo-ssDNA function of the tQ01-X2 is required.

5. Sangon Biotech, ssDNA Rapid Quantification Kit, contains ssDNA Quantification Buffer and ssDNA Standards. This kit offers high selectivity for ssDNA and enables precise quantification of samples with concentrations ranging from 500pg/μL to 200ng/μL. It also exhibits good tolerance to common contaminants such as salt, free nucleotides, solvents, detergents, and proteins. To measure sample concentration using this reagent, the Oligo-ssDNA function of the tQ01-X2 is required.

6. Thermo Fisher, Qubit RNA HS Assay Kit, contains RNA HS Quantification Buffer, RNA HS Dye, and RNA HS Standard. This assay kit offers high selectivity for RNA and double-stranded DNA (dsDNA). It enables precise quantification of samples with concentrations ranging from 0.2ng/μL to 200ng/μL. It exhibits good tolerance to common contaminants such as salt, free nucleotides, solvents, detergents, and proteins. To measure sample concentration using this reagent, the RNA-RNA High Sensitivity function of the tQ01-X2 is required.

7. Sangon Biotech, RNA Rapid Quantification Kit, contains RNA HS Quantification Buffer, RNA HS Dye, and RNA Standards. This kit offers high selectivity for RNA and enables precise quantification of samples with concentrations ranging from 0.1ng/μL to 200ng/μL. It exhibits good tolerance to common contaminants such as salt, free nucleotides, solvents, detergents, and proteins. To measure sample concentration using this reagent, the RNA-RNA High Sensitivity function of the tQ01-X2 is required.

8. Thermo Fisher, Qubit™ Protein BR Assay Kit, which contains Protein BR Assay Reagent, Protein BR Assay Buffer, Standard 1 (0 mg/mL BSA) and Standard 2 (10 mg/mL BSA)，accurate quantitation of samples in the concentration range of 100 μg/mL to 20 mg/mL.

CHAPTER 3 INSTRUMENT INSTALLATION

The instrument can be installed by end user with basic training, if you encounter problem when install the instrument, please contact supplier for help.

3.1 Preparation and Inspection

3.1.1 Unpacking inspection

Please check carefully before unpacking, and pay attention to the following conditions:

1.The outer packaging contains obvious traces of deformation.

2.The outer packaging contains obvious traces of water immersion.

3.The outer packaging contains obvious signs of impact or damage.

4.The outer packaging contains signs that it has been opened.

If the above situation occurs, please contact the manufacturer or seller in time.

Packing List:

Item	Description	Unit	Quantity
1	Fluorometer	Unit	1
2	Power Cord	Piece	1
3	USB disk (User Manual)	Piece	1
4	Packing List	Copy	1

3.1.2 Appearance Inspection

After unpack the outer box, please inspect the appearance of instrument as following items:

1.The packing bag (or packing film) inside the instrument is free from damage and scratch.

2.The instrument plastic shell is free of scratches and dirt.

3.The visible metal parts of the instrument are free from scratches and rust.

4.The accessories and their packaging bags are not damaged.

CAUTION： *If there is damage or item lost, please contact to the supplier and do not install*

the instrument.

3.2 Install the Instrument

3.2.1 Environmental Requirements

Parameters	Specifications
Environment	Indoor use only
Operating altitude	Up to 2,000 meters above sea level
Ambient room temperature	15 ~ 30℃
Transport and storage temperature	-20 ~ 60℃
Relative humidity	≤75%

1.The instrument must be installed on a solid and flat table, and the four corners of the instrument must be in contact with the table.

2.It is strictly forbidden to expose the instrument to direct sunlight.

3.The instrument should be kept away from heat sources and liquids.

CAUTION: *Operation of the instrument beyond the environmental conditions described above will not guarantee the reliability of the data. If the temperature and humidity exceed the above ranges, please use indoor air conditioning equipment and avoid direct airflow to the instrument.*

3.2.2 Electrical Requirements

1.Power voltage: DC 5V，2A.

2.Maximum power usage 10W.

3.2.3 Power On the Instrument

1. After taking out the instrument, place the instrument on a flat, level, and dry surface.

2. Plug one end of the supplied power cord into the tQ01-X2 Fluorometer.

3. Plug the power cord into the power outlet.

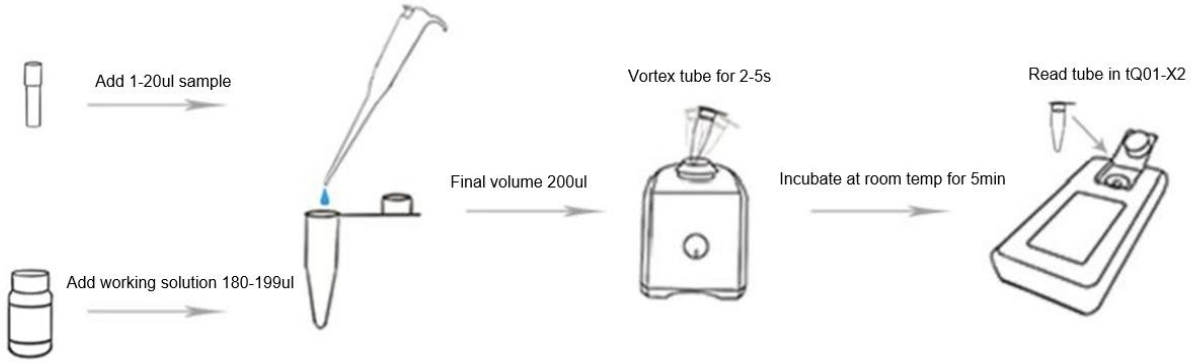
NOTE：

1.Use the provided power and data cables or use manufacturer-approved parts.

2.During the working process of the instrument, ensure that the power cable and data cable are connected reliably.

3.2.4 Load the Consumables

When conducting experiments, please use the consumables recommended in 2.2. The operation process is shown in the figure below:



1. Add 1-20μL sample to 500μL clear PCR tube;
2. Add 180-199 μL working solution to 500 μL clear PCR tube;

NOTE: The total volume of sample and working solution needs to be 200μL.

3. After capping the tube, vortex gently for 2-5 seconds and incubate at room temperature for 5 minutes in the dark;
4. After the instrument reads the standard, put the reaction tube into the instrument and select the sample volume;

5. Close the flip cover and start reading.

The Protein BR Assay detection process is as follows:

1. Add 10ul or 20μL sample to 500μL PCR tube;

2. Add 160ul or 150μL of BR Assay buffer to the 500ul PCR tube, making the total volume of sample and buffer to 170ul. Pipetting several times to mix well;

3. Add 30ul protein BR detection reagent to make the total volume reach 200ul. Cap the tube, vortex and mix for 5-7 seconds;

4. Incubate at room temperature for 10 minutes;

5. Test on the machine and read the result;

3.2.5 Load Non-Standard Volume of Reagent

The device is configured to detect a reagent volume of 200μl according to the standard. If users opt for a 100μl total volume for the purpose of saving reagents, the instrument is still capable of quantification. However, the results from the 100μl detection may not be as accurate and stable as the standard volume (200μl).

The sample volume range will be 0.5-10ul for 100ul system.

The setting volume on the machine should be the real volume X2.

3.2.5.1 **Instructions for 100μl Volume Detection**

1) Calibration Reagent Preparation

Prepare the calibration reagent by combining 95μl working solution with 5μl standard1 and Standard 2. After thorough reaction, proceed with the normal calibration steps to calibrate the instrument. The volume set as 10ul.

2) Sample testing

1. For the sample, mix 95 μl working solution with 5 μl of the test sample, set the volume as 10ul on the machine; or if use 99 μl working solution with 1 μl of the test sample, set the volume as 2ul on the machine.

2.After sufficient reaction of the reagents, transfer the mixture into the instrument and read the sample.

CHAPTER 4 OPERATION INSTRUCTION

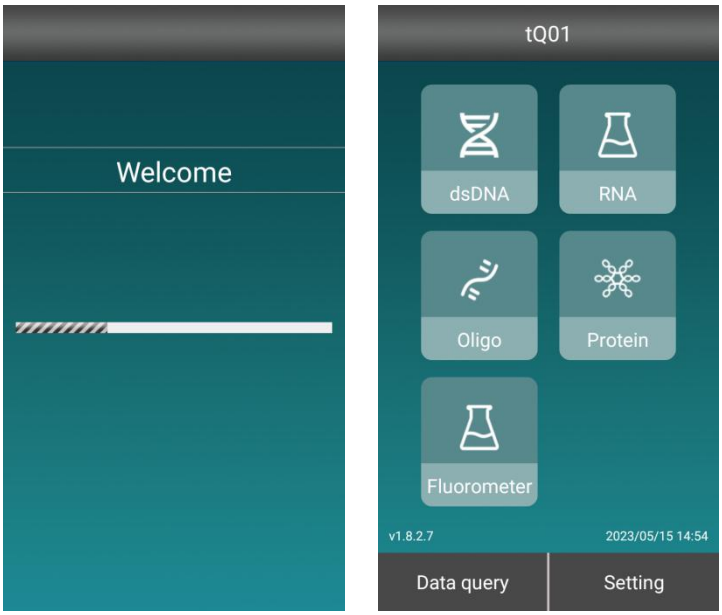
4.1 Operation Screen Startup

When the Fluorometer power cord is correctly connected, the system will be turned on automatically and instrument will start a self-test. After the self-test is completed, the main screen will enter into home page. The home page mainly includes experimental items, settings and data query.

NOTE：

If the instrument is powered off during the self-test process, it will take 5 minutes for the system to start when the instrument is restarted again, please wait patiently.

As shown in the figure below :



- Experimental items: including dsDNA, RNA, Oligo, Protein and Fluorometer five experimental items;
- Data query: you can query the historical experimental data ;
- Settings: Perform basic settings on the instrument, such as time settings, device information, software updates, etc.

4.2 UI Introduction

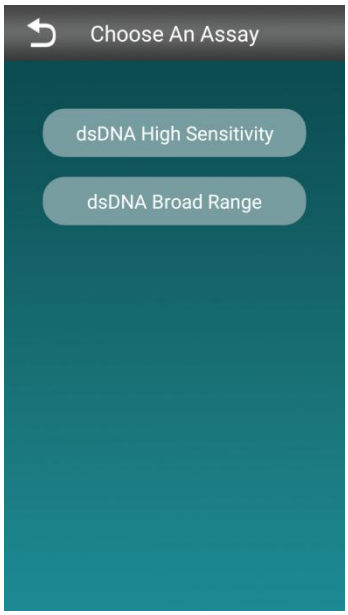
4.2.1 Experiment

4.2.1.1 Detectable concentration range of dsDNA,Oligo,RNA and Protein

◆ **dsDNA**

This part is mainly to detect double-stranded DNA (dsDNA). Click dsDNA on the home page to go to the following page. The test range of each function is shown in the table below:

Function	Sample concentration range（ng/μL）	Total Amount（ng）
dsDNA High Sensitivity	0.005-120	0.1-120
dsDNA Broad Range	0.2-2000	4-2000

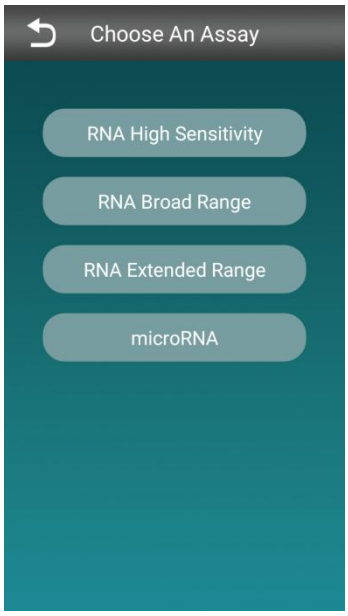


◆ **RNA**

This part is mainly to detect RNA. Click RNA on the home page to go to the following page. The test range of each function is shown in the following table:

Function	Sample concentration range	Total Amount（ng）

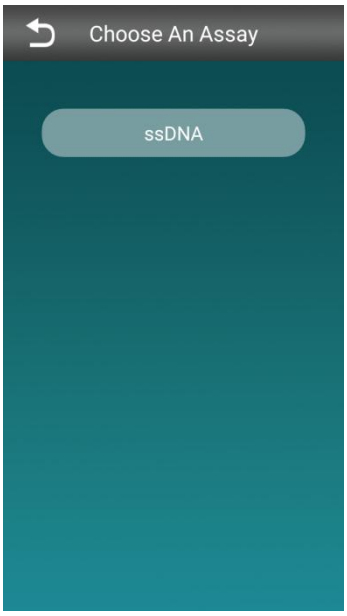
RNA High Sensitivity	250pg/μL and 100ng/μL	5-100
RNA Broad Range	1ng/μL-1μg/μL	20-1000
RNA Extended Range	10ng/μL and 10000ng/μL	200-10000
microRNA	50ng/mL-100μg/mL	1-1000



◆ Oligo

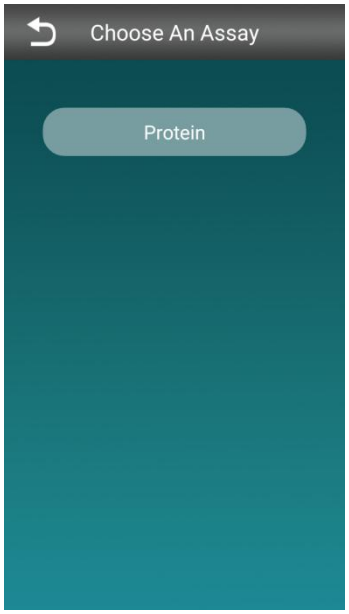
This part is mainly to detect single-stranded DNA (ssDNA). After clicking Oligo on the home page, it will go to the following page. The test range is shown in the table below:

Function	Sample concentration range	Total Amount（ng）
ssDNA	0.05-200	1-200



◆ Protein

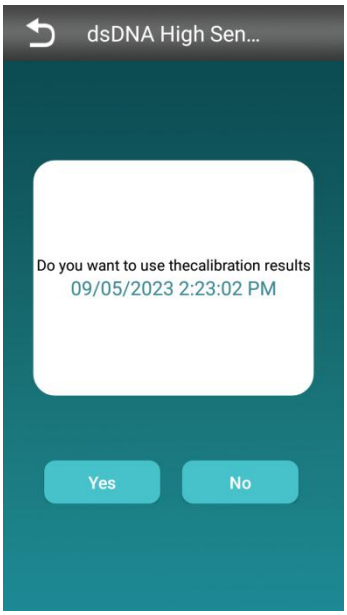
Function	Sample concentration range	Total Amount（ng）
Protein BR Assay Kit	100 ug/mL-20 mg/ml	1-400ug



4.2.1.2 Experimental operation steps

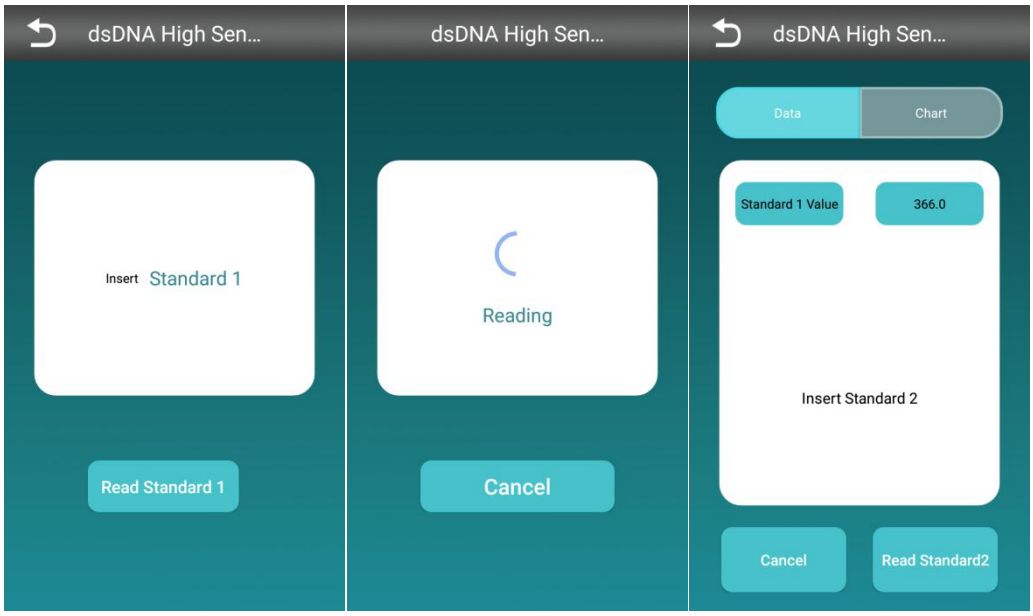
Taking the dsDNA High Sensitivity assay as an example, the operation steps are as follows：

Click ‘dsDNA High Sensitivity’ on the screen, you will be asked whether you want to use the previous calibration result or not,as shown in the below image. If you use the last calibration result to perform the experiment, click "Yes", and the instrument will go to the sample volume setting page. If you need to re-calibrate, click "No"；



If re-calibration, the following page will be displayed:

After putting in the standard value 1, click to read the standard value, follow the prompts to insert the standard value 2, as shown in the figure below, click to read the standard value 2.



After the calibration, go to the following page, you can choose two display modes of data and charts, click "Read Tube" to carry out the experiment;

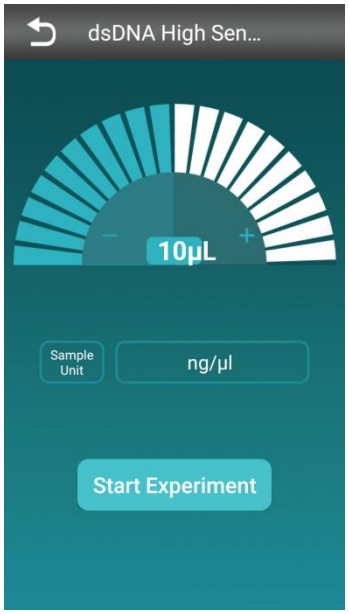
Please set the sample volume (1-20μL), there are two ways to set the sample volume：

- Slide the fan-shaped block left and right to set the sample volume；
- Click "-" or "+" to decrease or increase sample volume；

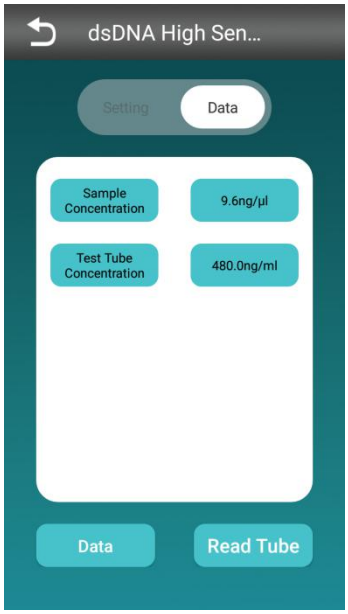
Select the Sample Unit.

Insert the sample tube.

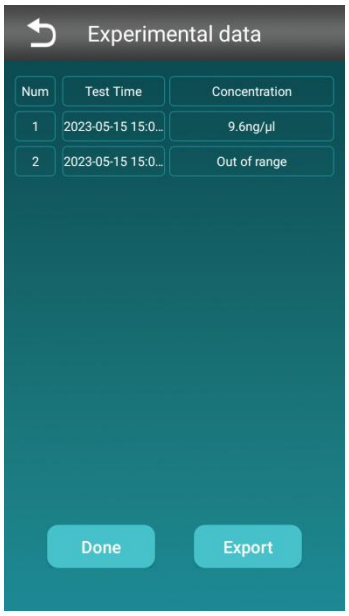
Close the flip cover of the instrument and click to start the experiment:



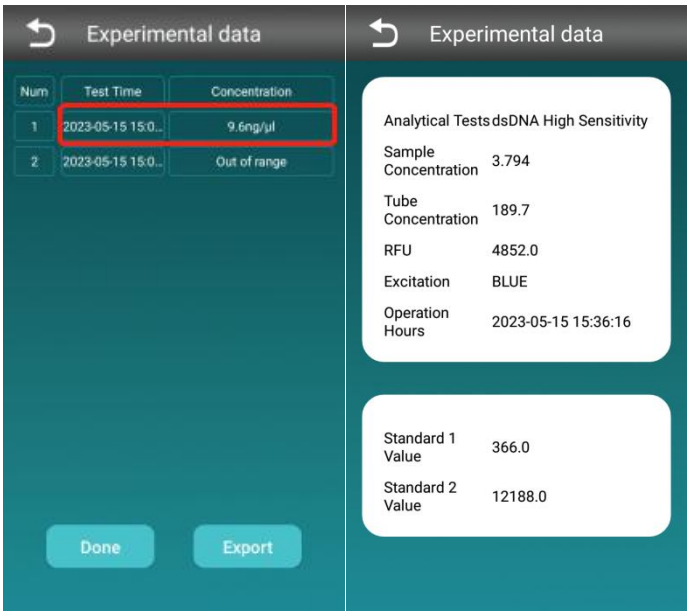
The experimental results are shown in the figure below：



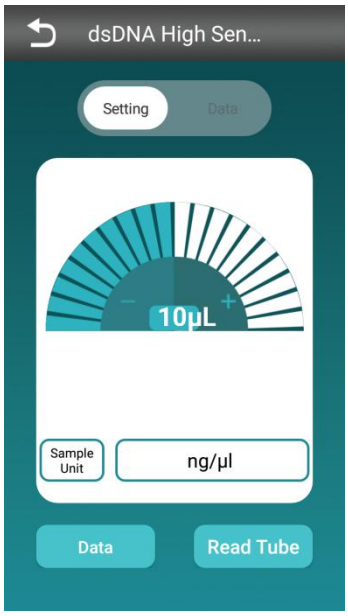
Click "Data" in the lower left corner to view the experimental data of the current experiment, as shown in the figure below：



Click anywhere in the box below to view the experimental information of the corresponding project.

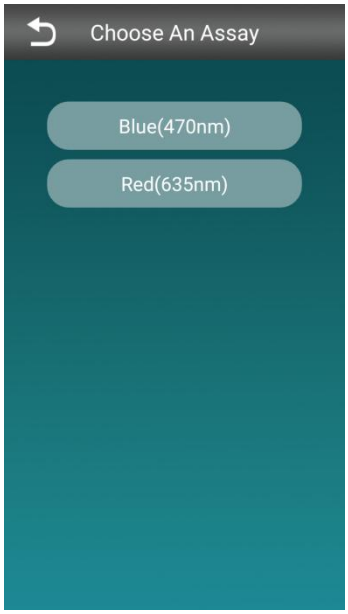


If you need to reset the sample volume, click "Settings" in the upper left corner to go to the sample volume setting page, as shown in the figure below. If you need to continue the experiment, put in a new sample tube, and after the cover is closed, click " Read tube" to continue the experiment..

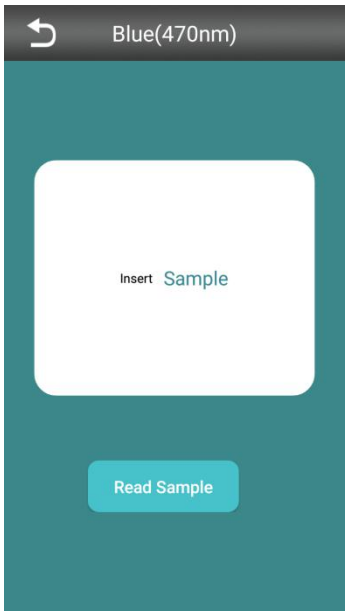


4.2.1.3 Fluorometer

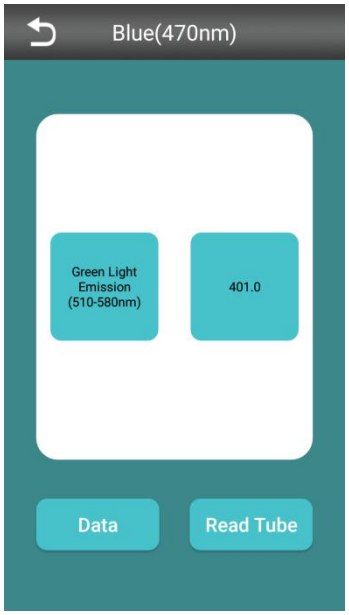
After clicking Fluorometer on the homepage, go to the following page and select the corresponding experiment：



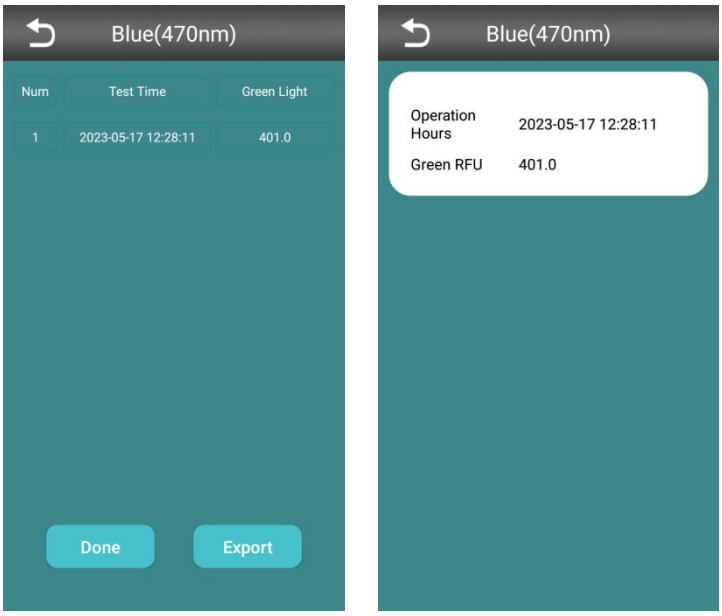
After selecting the experimental item, following the prompts to put in the sample and click "OK" to start the experiment.



The experimental results are shown in the figure below：



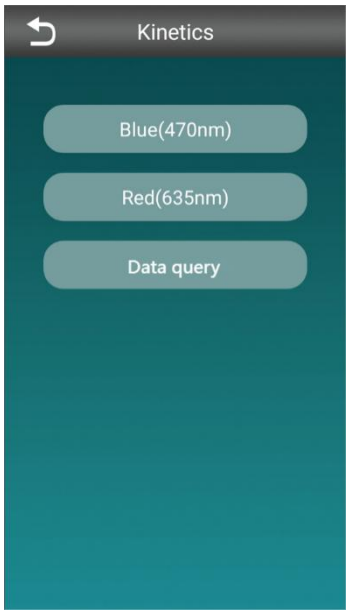
Click "Data" to view the current experimental data, as shown in the figure below:



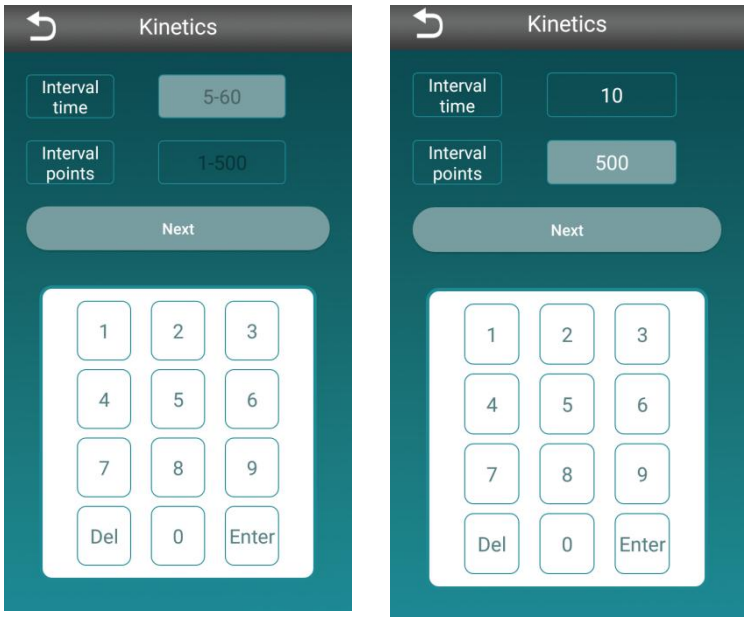
If you need to continue the experiment, you can replace the sample tube, close the cover, and click "Read Test Tube" to continue the experiment.

4.2.1.4Kinetics

The Kinetics project is used to observe the kinetic curves of reagents or drugs in research and development experiments. Upon clicking on "Kinetics" on the homepage, you will be redirected to the following page, where you can choose the corresponding experiment.

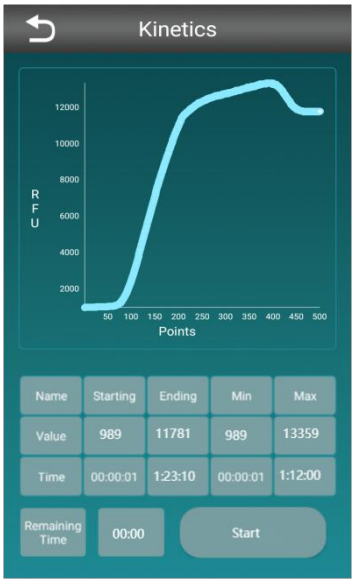


After selecting the desired experiment, you will be redirected to the following page to set experimental parameters according to user requirements.



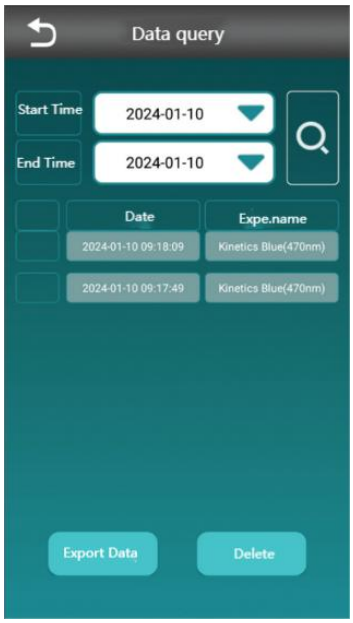
Example: Add reagent (volume: 100-200μl), set the interval time to 10 seconds, and the interval points to 500. The experimental run page is as follows.

After setting the experimental parameters, click ‘Next’ to enter the detection page. The page displays information such as kinetics curves, start/end-point fluorescence, max/min fluorescence, and time to reach each fluorescence point. Click ‘Stop’ to end the experiment. The result graph is as follows.

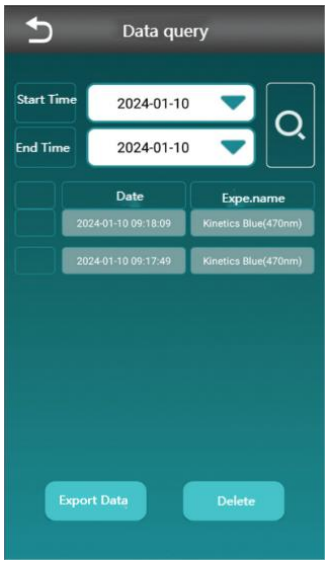


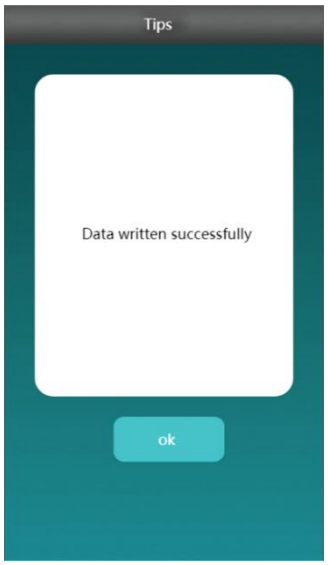
4.2.1.5 Kinetics-Data query

The data retrieval for the Kinetics project is separate from the data retrieval for other experiments. Click on the data retrieval option within the Kinetics project to obtain the data results for Kinetics experiments. The redirected page looks like the following:



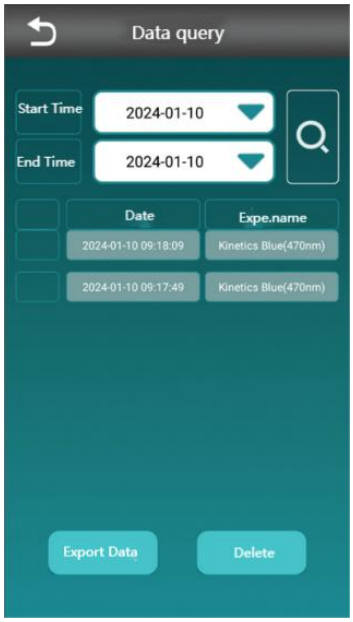
You can retrieve relevant experimental data based on time. Click on the respective experiment to view the experimental data. Check the experiments you want to export or delete. To export experiments, insert a USB flash drive, then insert the USB drive, check the experiments, and click "Export Data," as shown in the following page.





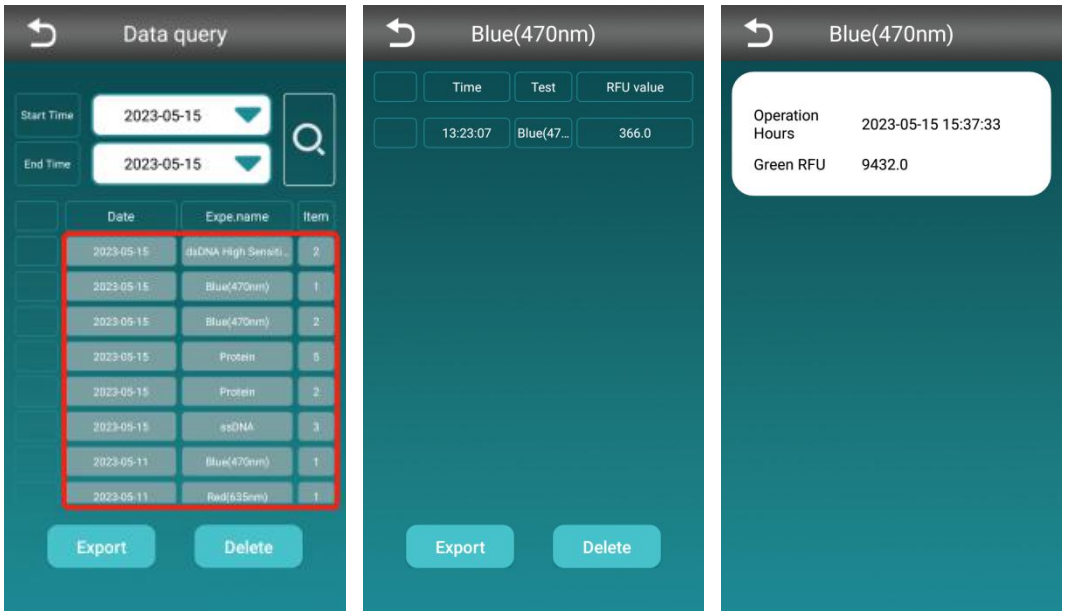
4.2.2 Data Inquiry

Click "Data Query" on the home page to go to the following page；

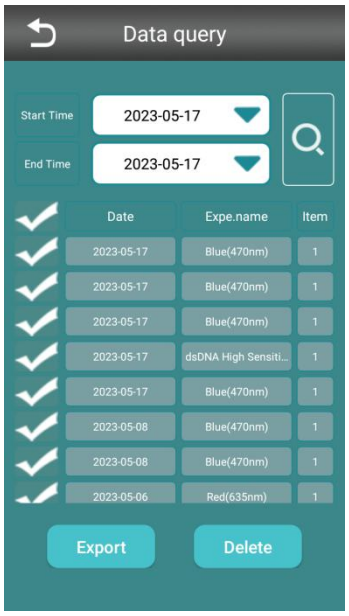


Relevant experimental data can be queried according to time, and relevant experimental information can be viewed, exported or deleted by selecting the corresponding experiment；

Click anywhere in the box below to view the experimental information of the corresponding project.



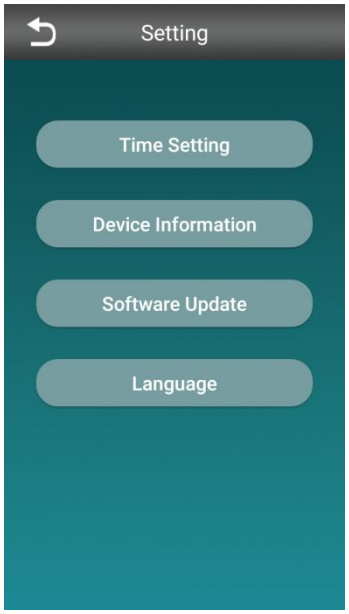
Select the corresponding experiment to perform export and delete operations, as shown in the figure below, if you need to export the experimental data, you need to insert a U disk.



NOTE：To export data, you need to insert a U disk. If no U disk is inserted, a prompt will appear that the device U disk is not detected.

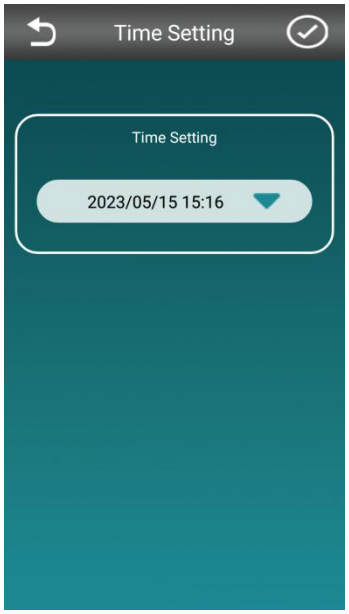
4.2.3 Setting

Click "Settings" ,system will enter into following page:



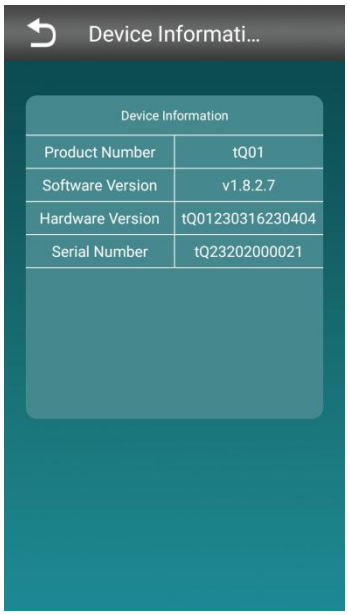
4.2.3.1 Time Setting

This part can set the time of the instrument, click "Time Setting" to go to the following page, click the drop-down button to set the time of the instrument. Click  to save the changes.



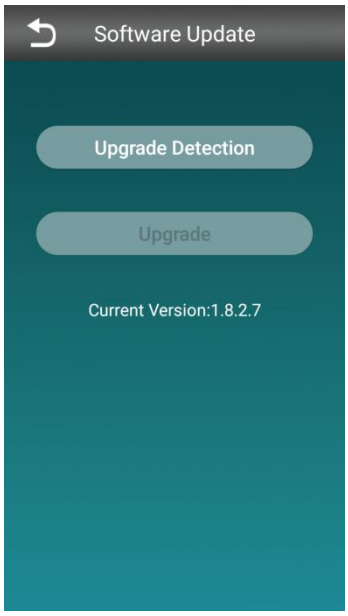
4.2.3.2 Device Information

You can view the hardware information of the instrument. Click "Device Information" to display the following page.



4.2.3.3 Software Update

If you want to update the software, you need to insert the U disk with the new version of the software into the instrument, you can check the current software version and update the latest version, click "Software Update" to go to the following page.



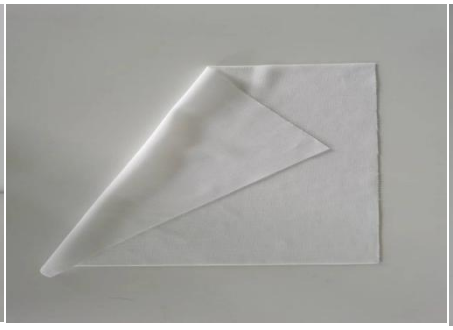
CHAPTER 5 MAINTENANCE

5.1 Instrument Maintenance and Cleaning

To ensure the performance of the instrument and reduce contamination, the instrument requires regular weekly cleaning.

.If contamination occurs, wipe all accessible parts (heating block, heat cover, sealing ring, etc.) with a clean rag of 70% ethanol. Let dry naturally.

alcohol/water



cleaning cloth

cotton swab

WARNING:

Do not wipe with a damp cloth, or rinse the instrument with water.

NOTE:

1. Do not use solvents or strong detergents to clean the instrument, as this may damage the plastic case of the instrument and reduce its function.

2.Before cleaning and replacing, turn off the power of the instrument.

3.Do not drop any liquid or nuts into the instrument.

4.Do not spill water or ethanol on the parts, please use a rag to wipe.

5.Do not turn on the power until the instrument has dried naturally.

CHAPTER 6 TROUBLE SHOOTING

Number	Failure	Possible causes	Processing method
1	Turn on the instrument power, the instrument does not respond	Power cord connection is loose	Plug in the power cord again and tighten it
		The wiring port is damaged	Contact the Supplier
2	Display appears lighter or darker	Instrument is too hot or cold	Suspend the use of the instrument, adjust the room temperature, and continue to use it after the instrument returns to normal temperature
		Using the Instrument in Unsuitable Lighting	/
3	Incomplete display or wrong display on the display	Display window is dirty	Clean the display window
		Display window is scratched or dented	Contact the Supplier
		Display or instrument damage or error	Contact the Supplier
4	No response to keyboard presses	Some buttons are only valid after a certain program is selected	/
		Damaged or faulty keyboard or instrument	Contact the Supplier

CHAPTER 7 Q&A

1.Why do the readings decrease over time when using fluorescence timing?

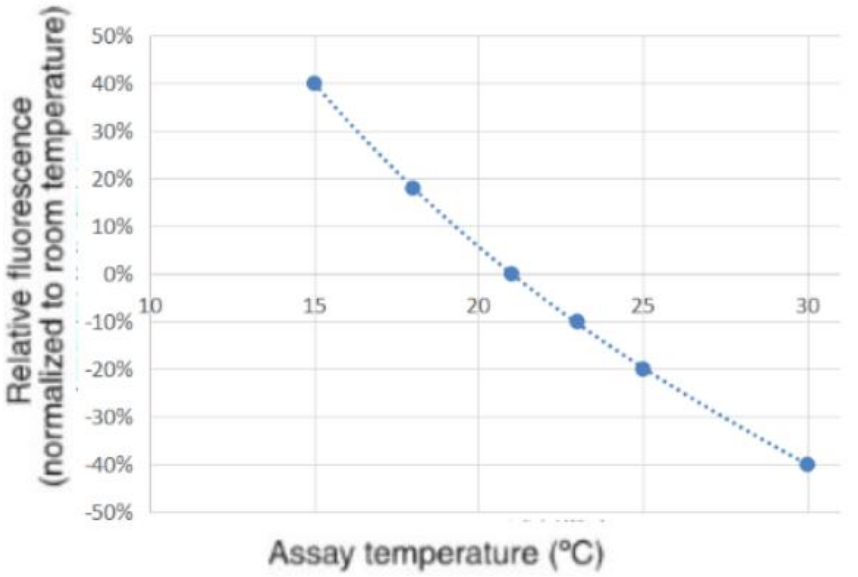
- Ensure a 2-minute incubation before taking readings (15 minutes for proteins).
- If the test tube is left in the fluorometer for multiple readings, the readings will decrease as the tube warms up inside the instrument.If multiple readings are required, remove the test tube from the instrument, place it on a test tube rack, let it equilibrate to room temperature for at least 30 seconds, and then take the readings again.
- For samples stored in the dark, readings can be taken within 3 hours after mixing. Beyond this time, the readings will be inaccurate.
- During reading intervals, store standard and sample test tubes in a dark, light-shielded location.

2.When do the.repeatability test.for.one sample, if measured continuously without removal, why do the values keep decreasing?

Under continuous excitation by the excitation light, the fluorescence dye's half-life decreases, resulting in a reduction of the collected fluorescence signal and subsequently lower recorded data. It is recommended to remove the sample from the instrument after reading, wait for approximately 5 minutes, and then read the sample again. This procedure minimizes potential deviations.

3.Will the values vary with different ambient temperatures during testing?

Yes, they will. The fluorescence signal strength of the corresponding fluorescent dye inside the fluorometer may exhibit deviations at different temperatures. Generally, values measured at lower temperatures tend to be higher, while values at higher temperatures may be lower (when testing standard samples in the reagent kit at room temperature, the overall error range is approximately 10%, with a maximum error of around 15%).


Relative fluorescence
(normalized to room temperature)
50%
40%
30%
20%
10%
0%
-10%
-20%
-30%
-40%
-50%
10
15
20
25
30
Assay temperature (°C)