SMW16.1

Smart Microplate Washer

INSTRUCTION MANUAL

User Safety Tips

Before you use the instrument, please carefully read this "INSTRUCTION MANUAL".

It is a protective earthing terminal.

Not any person allowed to remove, replace, otherwise there may occur an electric shock or fire, do not operate any action other than maintenance described in the instruction manual.

Confirmed the use of a specified power supply, if not, there may be a fire or electric shock. Independent power supply should be used. If other electrical equipment uses the same power outlet, the socket will be particularly hot, which is easy to cause fire.

When you pull the plug off, do not pull the power cord, the plug should be pulled by your finger, otherwise you may get an electric shock or a short circuit may cause a fire.

Do not use wet hands to plug the power supply off, otherwise it may cause an electric shock.

Do not damage the wires and connecting cables. Do not trample, twist, pull wire or cable. If wire or cable is snapped, an electric shock or fire can

occur.

Do not use damaged wires and cable jumper, electric shock or fire may occur.

Do not use the wire and cable which can not meet the design requirements. If the capacitance is low, it will trigger a fire.

If there are abnormal situations, the operation should be stopped immediately.

If there is burning smell or odors, turn off the power immediately and unplug the power line.

Using the power outlet with a good grounded capability, otherwise when the instrument leakage occurs, it will cause an electric shock.

The operations you perform should be in accordance with the provisions or guidance of the "INSTRUCTION MANUAL" .

Do not use turpentine oil, benzene or other chemical agents to clean the external stains, because they may cause changes in color and shape. Scrub the instrument with a soft cloth or wet cloth. For the serious stains, it is helpful to use cleaning agents or 75% alcohol to clean them.

When screws or metal objects fall into the instrument, stop the operation immediately and ask qualified maintenance personnel to remove the metal objects, then restart the instrument, or it may cause equipment failure.

Do not place the reagent and water on the instrument table, avoiding

the liquid leaks into the instrument and damage it.

Contents

1、Introduction

SMW16.1 Smart Microplate Washer, which is monitored on an Android tablet PC, is an intelligent product for cleaning microplates. The features of the product include interface visualization, complete systems integration, easy operation, high reliability, intensive washing, and adapt to various types of microplates. It is used to clean the microplate and effectively separate the free phase from the binder phase during experiment. The instrument adopts the Android tablet PC display both in Chinese and English. The setting is easy and the bottle is fixed in the mainframe to make it convenient for users. The APP which is installed on an Android tablet PC has simple graphical interface, convenient operation and automatic switching functions. It only needs to click a few buttons to complete the operation.

This instruction manual contains all essential information for the user to operate the SMW16.1 Smart Microplate Washer, including installation, operation, adjustment, maintenance, ect. Please read the manual carefully before using the instrument.

The contents of this manual and the the product specifications are subject to change without prior notice.

The company reserves the right to change the product specifications and its supplied reagents without notice. At the same time, the company will not take the responsibility of the damages caused by the used reagents (including consequential damages), including but not limited to typographical errors and other errors related to the publications.

2、Technical function

2.1 Input power

Whole working power: 70 W

2.2 Fuse

Specification：110 V~220 V，5 A

2.3 Working conditions

2.3.1 Environment temperature：5 ℃~40 ℃For indoor use.

2.3.2 Relative humidity: When the temperature is lower than 31 ℃, the relative humidity is less than or equal to 80%. When the temperature is 40 ℃, the relative humidity will decline linearly to 50%.

2.3.2 Atmospheric pressure：86 kPa~106 kPa

2.3.4 Surrounding: no strong magnetic field interference and mechanical vibration, no corrosive gas.

2.3.5 Power condition: alternating current 110 V~220 V；frequency：50Hz

2.3.6 Working time: 8 hours

2.4 Storage and transportation conditions

2.4.1 Environment temperature：-20 ℃~55 ℃

2.4.2 Relative humidity: ≤95%

2.4.3 Atmospheric pressure：86 kPa~106 kPa

2.4.4 After the instrument is unpacked and assembled from storage and transportation package, it should be standing for more than 24 h under normal working environment.

2.5 Technical parameters and functions

2.5.1 Cleaning head: 8 needles, 12 needles

2.5.2 Cleaning frequency: 0~255

2.5.3 Cleaning row: 1~12

2.5.4 Cleaning channel: 2 (1 for wash buffer and 1 for distilled water)

2.5.5 Soaking time: 0~255 seconds

2.5.6 Shaking time: 0~255 seconds

2.5.7 Residual volume: ≤1 μL/well

2.5.8 Dispense precision: ≤±3% CV: 300 μL/well

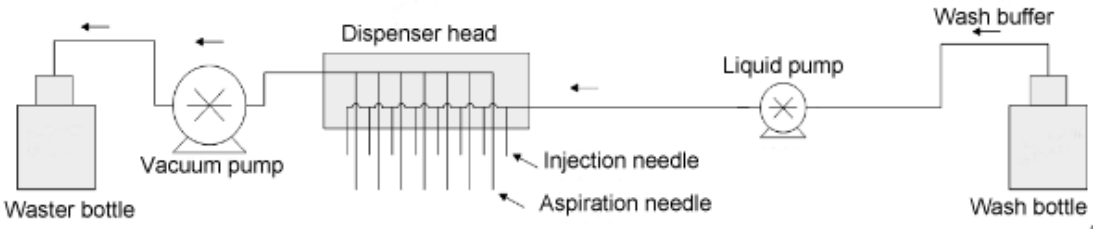
2.5.9 Volume range: 0~350 μL/well

2.5.10 Weight: 7.5 kg

2.5.11 Dimensions：400 mm×285 mm×150 mm

2.5.12 Basic functions: Compatible with flat, U- or V-bottom plates as well as strips

2.6 Working principle and basic diagram

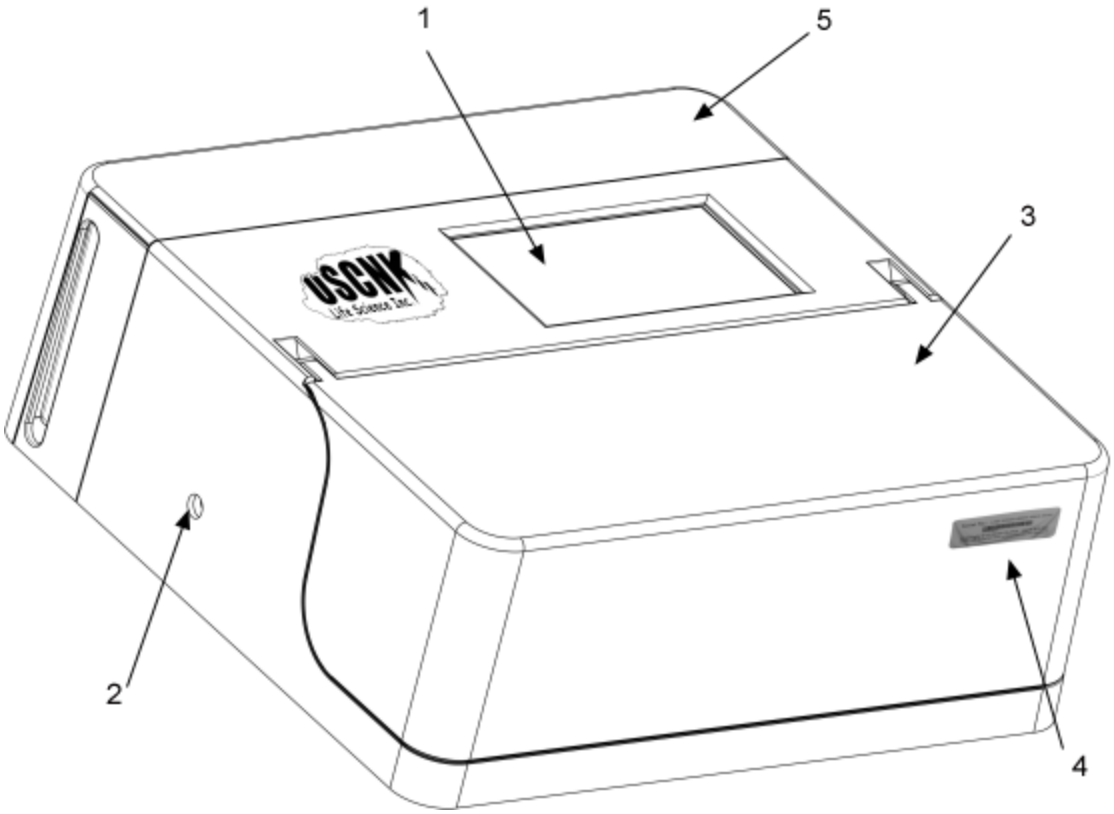


2.7 The product components

The instrument consists of the parts of control circuit, positive pressure and negative pressure pump systems, the control parts of electromagnetic valve , reagent bottles, tablet PC, etc.

2.8 Sketch map of the appearance

2.8.1 Front view



1 tablet PC

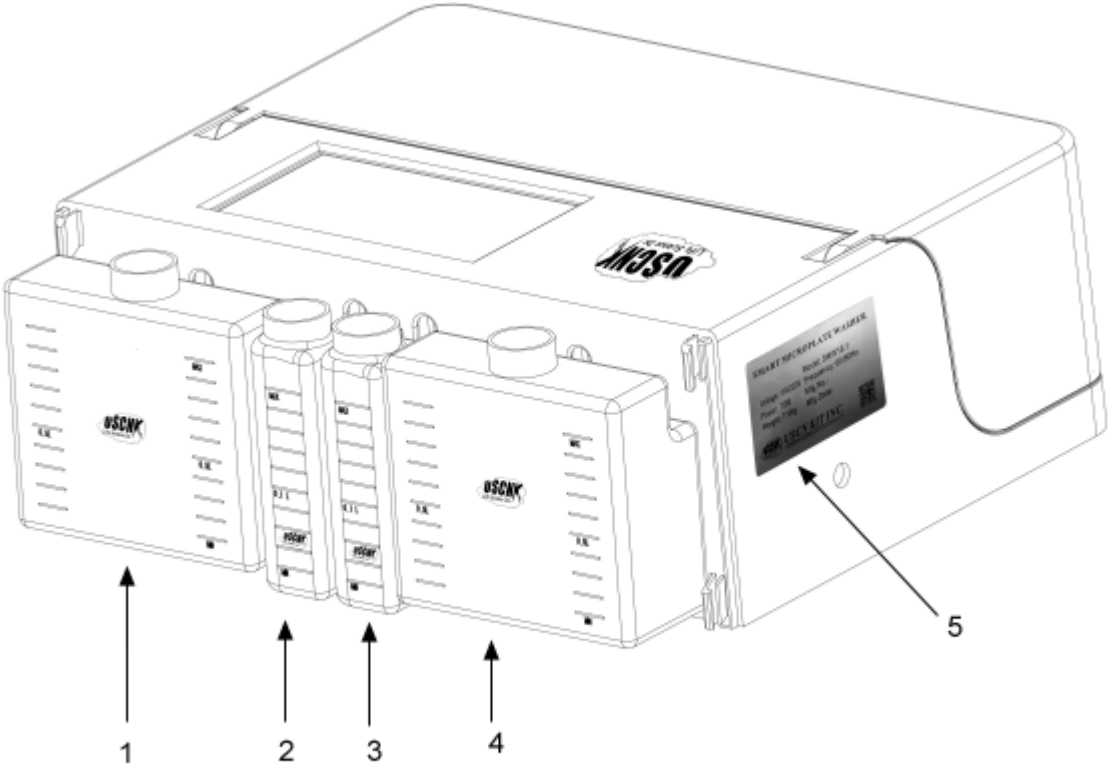
2 pressure controlled valve

3 cover plate

4 product serial number

5 rear cover

2.8.2 Rear view



1 waste bottle

2 vacuum bottle

3 distilled water bottle

4 wash bottle

5 nameplate

3、Installation

3.1 Unpacking

Carefully unpack the instrument and accessories. Check whether damaged or not. Place the instrument on a stable and horizontal workbench. Slightly put wash bottle, vacuum bottle, waste bottle and distilled water bottle in the rear holder of the instrument, then put the rear cover on.

3.2 Power and environmental requirements

3.2.1 Power of microplate washer: AC 110 V~220 V, 50 Hz/60 Hz

3.2.2 Protective grounding: Since the protective earthing of the microplate washer is adopted to connect the power cord and power supply network, the power cord of the instrument should be plugged into the network with reliable protection grounding power (AC 110 V~ 220 V , 50 Hz / 60 Hz).

3.2.3 Keep the instrument from dust, shock and avoid strong electromagnetic interference and corrosion contacts, and the instrument does not cause any strong electromagnetic interference to other power sources or networks. The instrument is required to run under normal operating conditions specified in Article 2.4. The equipment should not be closed to the wall by less than 10 cm in order to ensure air circulation.

Enough space should be available near the power outlet to ensure that if an emergency happens, it can be quick and convenient to unplug the power plug from the power outlet.

3.3 Connection of pipelines

3.3.1 Specification of bottles: 1 L×2， 0.2 L×2, Waste bottle (1 L), Vacuum bottle (0.2 L), Distilled water bottle (0.2 L), Wash bottle(1 L)

3.3.2 Connect the wash bottles with the A/B/C/D/E/F/G/H/I at the back of the instrument by the silicone tube.

3.3.3 Connect 8 or 12-pins pipe nipple to cleaning head by silicone tube according to the color, then place it on the holder. The cleaning head should be able to move freely up and down on the holder, but the gap between them should be as small as possible (Appropriate instrument factory adjustment has been performed).

3.3.4 Pressure controlled valve: It is for adjusting the flow rate of liquid during washing. It has been set to median position when produced in the factory. To adjust, refer to section 5.3.

3.4 Power on and test

3.4.1 After finishing the above procedures, pour the distilled water or pure water which should be less than three-fifths of the bottle into the wash bottle, then tighten all reagent bottles' caps.

3.4.2 Plug the power cord into power input jack which is on the back of the instrument, then plug the power cord into the AC power supply network. In the case the voltage is not stable, the user should use the UPS power supply or AC voltage stabilizer.

3.4.3 Power on, reset and initialization of the instrument.

Select “Flushing Pipelines”, check whether the water flows from the cleaning head or not. If not, use the nozzle cleaner to dredge the needles. For first-time use or in the case it is unused for a long time, it is better to dredge the long or short needles again before using.

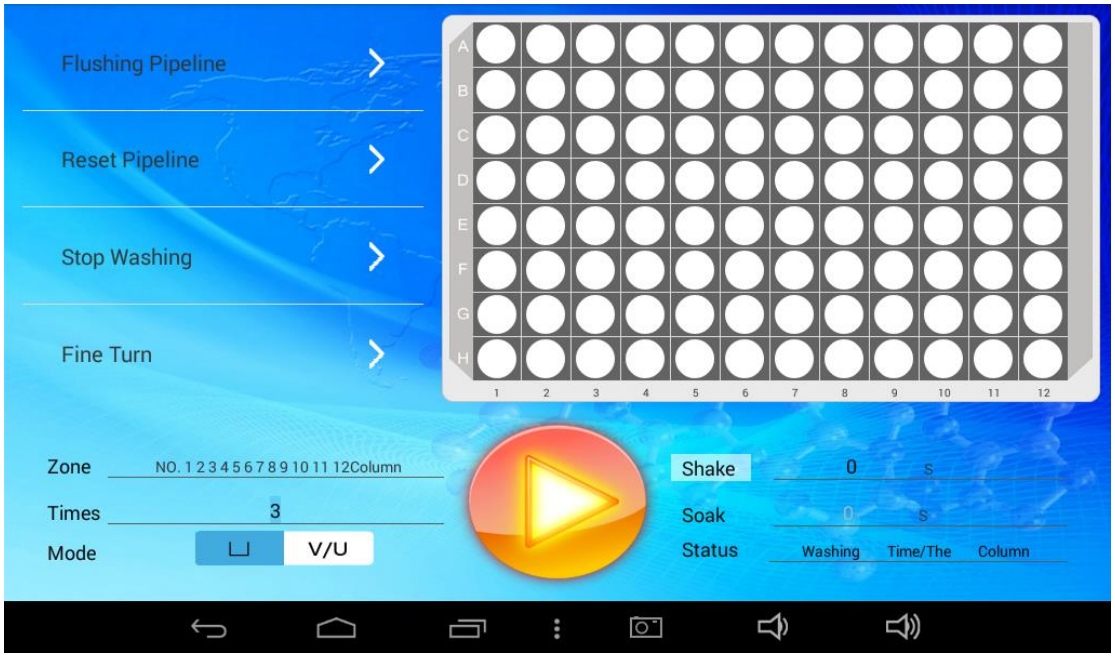
Attention: Be careful when using the nozzle cleaner.

3.4.4 Start-up interface of the Tablet PC boot:

4、The function of Tablet PC

SMW16.1 Smart Microplate Washer adopts a 7-inch tablet computer with Android v4.4 system. It supports Bluetooth BLE4.0, and the wireless transmission distance is up to 100 meters in non-occluded environment. The instrument uses double solenoid valve, and can switch distilled water and wash buffer automatically.

4.1 APP main interface



Instruction:

The default interface displays settings for the microplate cleaning operation, the user can carry out the cleaning process by setting parameters easily.

4.2 Tablet PC performance

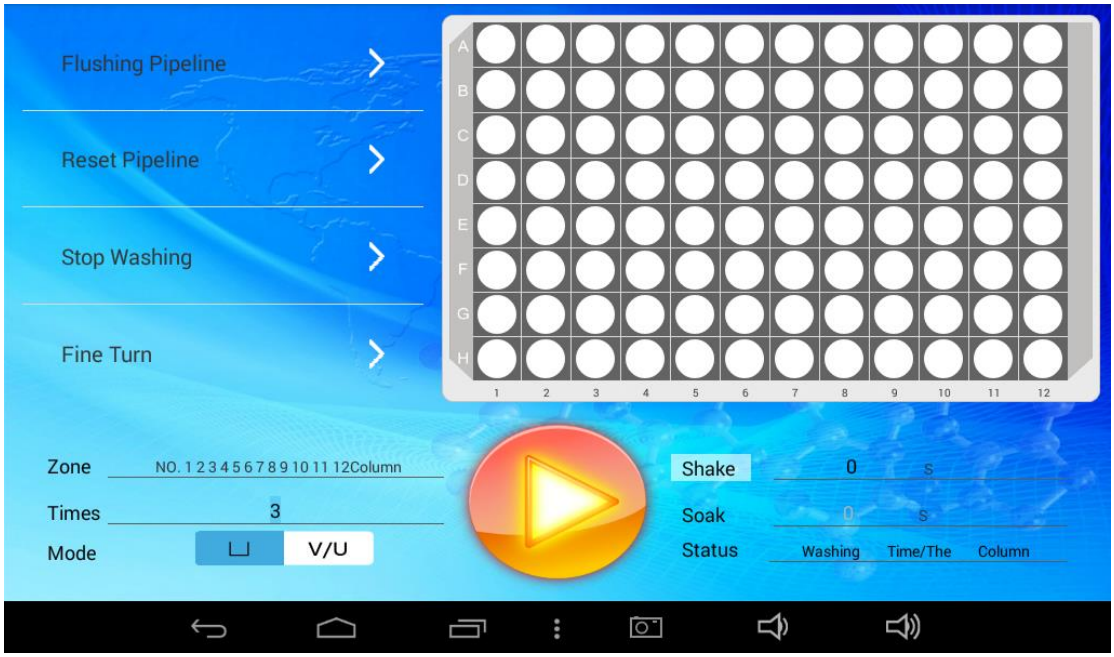
Main Part	
Color	Black
System	Android 4.4
Configure	
Storage Capacity	8 GB eMMC
Processor	C3230
System Memory	1 GB
Extended Support	Micro SD
Display	
Screen Size	7 inch
Screen Resolution	1024x600
Aspect Ratio	16:10
Screen Type	IPS
Pointing Device	Touch
Connecting	
WiFi Function	Available
Sound	
Speaker	Available

5、Instrument operation

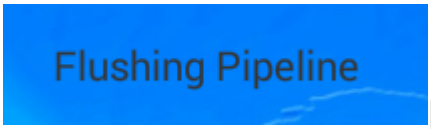
Note: If not operate according to the specified methods in the manual, the protection provided for the instrument may be damaged.

5.1 Working interface

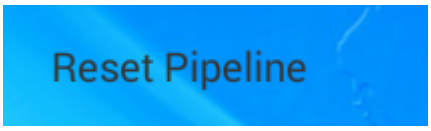
After start-up, tablet PC will directly enter into the work interface as follows:



Introductions:

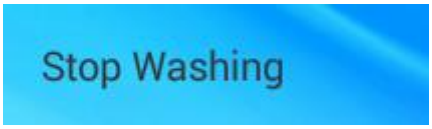
1 

[Flushing pipeline]: Click the button, the instrument will clean the pipeline automatically using the distilled water.

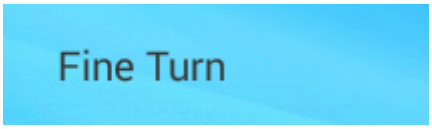
2 

[Reset pipeline]: Click the button, the

instrument will reset the cleaning head to original starting position.

3 

[Stop washing]: Click the button, the instrument will force the washing to stop.

4 

[Fine turn]: Click the button, the instrument will enter into the instruction program of Fine tune. See Section 5.2.

5 

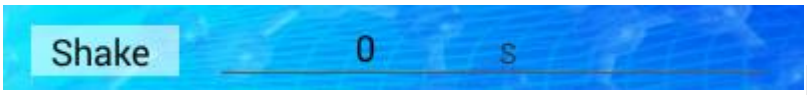
[Zone]: The cleaning setting is from column 1 to column 12 by default. If it needs to skip cleaning, click the microplate diagram which is in the upper right corner, select the rows which don't need to be cleaned.

6 

[Times]: The cleaning setting is 3 times by default. The adjustable range is from 1-255 times.

7 

[Mode]: Click the button, and select the type of microplate such as flat base, V base and U base.

8 

[Shake]: The vibrating time is 0 by default. The vibration function can be set and the

adjustable range is from 0-255 seconds.

9 

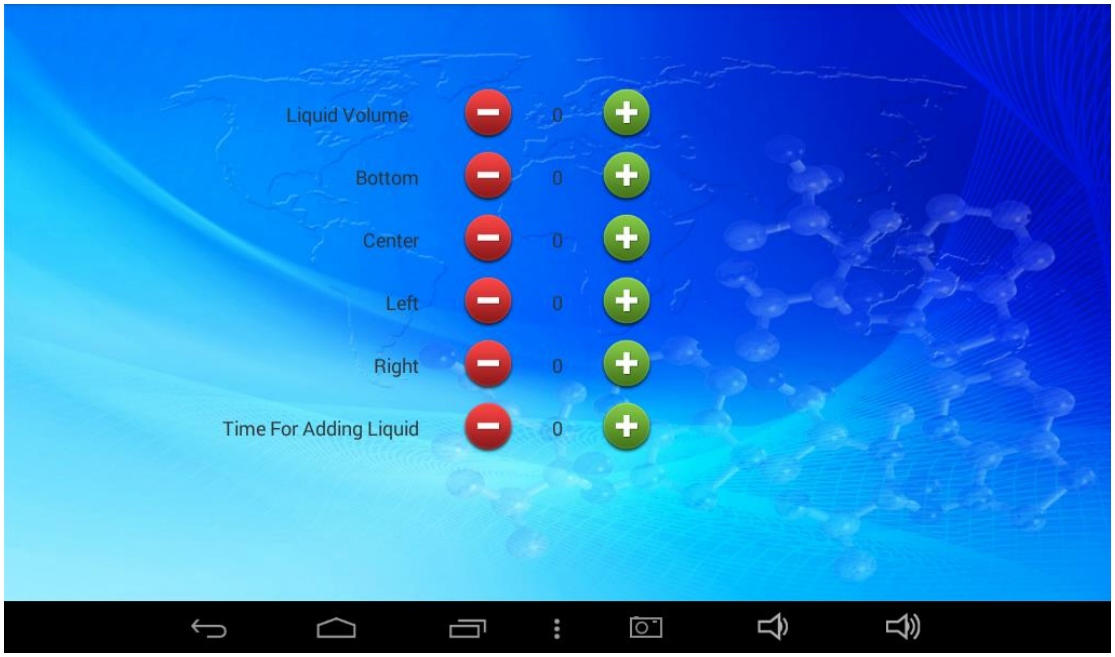
[Soak]: The soak time is 0 by default. The soak function can be set and the adjustable range is from 0-255 seconds.

10 
[Start]: Click to clean the microplate.

11 Status Bar: Display the working state of the instrument, and the displayed parameters are the cleaning frequency and cleaning columns.

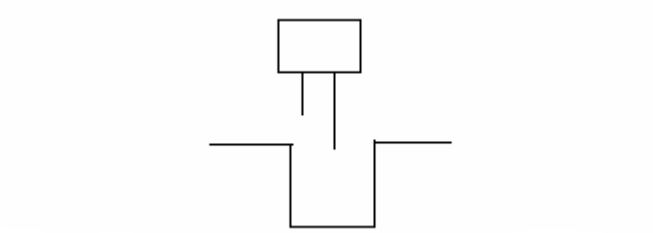
5.2 Fine adjustment of the settings interface

Mainly set the parameters of liquid volume, cleaning head location, time of adding liquid, etc. The interface is shown as follows:



Introduction:

Adjustment of liquid injection position: the liquid injection position decides the distance from cleaning head long needle to the well surface. The selected position define the the top position for maximum volume of liquid during injection. Liquid beyond the position will be sucked out, which features the function of anti-overflow. Adjust the addition and subtraction key, cleaning head long needle can be positioned to the well surface. Generally, it can be slightly lower than the well surface for 1mm.



1 

[Liquid Volume]: Click the button, the instrument can set the injection volume of liquid.

2 

[Bottom]: Click the button, the instrument can adjust the distance from the cleaning head to the bottom of microplate wells and the adjustable range is -100%--+100%.

3 

[Center] : Click the button, the instrument can adjust the distance from the cleaning head to central position of microplate wells and the adjustable range is

-100%--+100%.

4 

[Left]: Click the button, the instrument can adjust the distance from the cleaning head to left position of microplate wells and the adjustable range is -100%--+100%.

5 

[Right]: Click the button, the instrument can adjust the distance from the cleaning head to right position of microplate wells and the adjustable range is -100%--+100%.

6 

[Time for Adding Liquid]: Click the button, the instrument can set the time to add liquid, and the adjustable range is -100%--+100%.

5.3 Pressure control

"Pressure controlled valve" can monitor the pressure in the wash bottle, thereby monitor the speed of liquid discharging. The pressure has been adjusted to median pressure in the factory. If users think the pressure is not expected, they can adjust it by themselves, releasing the nut on the valve needle, estimating the volume of water flowing out of the cleaning head short needle. When the valve needle is rotated externally, the pressure of the wash bottle decreases and the speed of flushing liquid

slows down. When the valve needle is rotated internally, the pressure of the wash bottle increases and the speed of flushing liquid increases. Rotate the needle valve to set the pressure as required, and then tighten the nut. A little bit of adjustment is required for the pressure regulation. The first operation can use pure water to replace the solution during the experiments.

Note: If the pressure is too high, the lotion will overflow. While if the pressure is too low, the liquid will be off and on or cannot fill the bottle.

6、**Attentions**

6.1 Read this manual carefully before using the instrument.

6.2 No waste liquid can be sucked into the pump, empty the waste bottle when it is filled with waste liquid.

6.3 After using it, take distilled water to flush the pipeline to prevent the liquid from crystallizing and blocking the cleaning head.

6.4 Do not place items that are not related to the operation on the table so as not to affect the movement of the bracket, and don't push and pull the bracket and the cleaning head device.

6.5 When pulling and plugging the rubber tube which is connected with the cleaning head, take the cleaning head off the support device firstly to protect the support device from deformation.

6.6 After the washing operation is completed, or the instrument will not be used for a long time, turn it off and unplug the power plug.

6.7 If it is not operated in accordance with the specified methods, the device may be damaged.

6.8 Consumable replacement: Replace and supply the distilled water and wash buffer in accordance with the instructions.

7、Daily care and maintenance

7.1 Maintenance

7.1.1 To ensure the stability and accuracy of the SMW16.1 Smart Mircoplate Washer, do not put the instrument in the strong magnetic field interference during the work environment, and ensure the environment ventilation, good air permeability at the same time.

7.1.2 Due to the relative movement of the bare bodies, the working environment of instrument should be against dust to keep the internal circuit clean.

Attention: Maintenance inspection should be completed by the manufacturer, local agency or other qualified staff.

If the parts need to be replaced, please use parts which are provided by the manufacturer and the agency.

7.2 Cleaning

7.2.1 Turn off the power switch and unplug the washer's power plug to make sure the instrument is disconnected with the power supply.

7.2.2 Wear disposable gloves to remove any remaining liquid on the microplate bracket with dry and clean cloth.

7.2.3 Wear disposable gloves, use disposable cloth stained with little water or mild detergent to clean the surface of the instrument. After using dangerous infectious material, please use this method to sterilize the instrument. Warning: Please turn off the power switch and unplug the power plug.

7.3 Disinfection

7.3.1 Wear disposable gloves and use disposable cloth dipped 75% ethanol or 1% glutaraldehyde (damp cloth without trickle liquid) to clean the carriage, interior door and exterior surface of the microplate washer.

7.4 Replace the fuse

Warning: Please turn off the power switch and unplug the power plug of the instrument.

Attention: Open the fuse holder by screwdriver. New fuse with the same specification is used to replace the burned fuse.

7.4.1 Install the fuse and tighten the fuse holder. Plug in and start up the

instrument.

7.4.2 Specification of fuse: 110 V~220 V, 5 A

7.5 Periodic check

Periodic inspection	Check item	Parts need to be checked	Purpose of inspection
Every day	Power supply	Plugs, sockets,power lines	Avoid incomplete contact, and power leakage which may cause personal injury.
Every day	Tightness	Connector of the tube	Avoid air leakage caused by incomplete contact, which affect the liquid flow out.
Every day	Moving part	Cleaning head	Avoid the inaccurate location of the cleaning head.
Every month	Tightness	Liquid bottle	Avoid air leakage caused by incomplete contact, and then affect the liquid flow out.
Half year	Tightness	Hose	Avoid air leakage caused by incomplete contact, and then affect the liquid flow out.
Half year	Impedance	Ground impedance of washer cover	Avoid personal injury caused by poor protection.

8、Troubleshooting

8.1 Open the power supply, no display of the instrument.

8.1.1 No voltage or power socket may be loose. Check whether there is voltage in the power socket, the connection of plug and socket is tight, then, insert the plug in the socket.

8.1.2 The power insurance disconnected.

8.2 With the power on, the instrument screen can display, but it can not do self-checking, no response of the button.

8.2.1 Restart the table PC, run the the system again.

8.2.2 The circuit board of the instrument may break down, contact with manufacturer for maintenance.

8.3 When the microplate washer is working, the short needle of the cleaning head has no wash buffer spray, or has less fluid.

8.3.1 The cap of the wash bottle was not tightened, or the nut in the mouth loosened, which cause the air leakage occur between the cap and the mouth.

8.3.2 The cracks or dead plait in the silicone tube cause blocking in the tube. Check whether it has cracks or dead plait in the silicone tube, if any, straighten the dead plait, cut the cracked parts, or replace part of the silicone tube.

8.3.3 Liquid inlet of the cleaning head or dispensing short needle was blocked by the sundries, use a needle to clean the short needle pipeline.

8.4 When the instrument completes the work, the residual seems too much in the microplate wells.

8.4.1 The cap of the vacuum bottle and waste bottle was not tightened,

or the nut in the mouth loosened, to cause the air leak occur between the cap and the mouth.

8.4.2 The draining mouth of the cleaning head and the long needle were blocked by the impurity, use a pincet to remove it if the draining mouth is blocked. Use a needle to clean the long needle pipeline if the long needle tube is blocked. Then, press “Flushing Pipeline” on the menu, rinse for several seconds, to make the impurity drained into the waste bottle.

8.4.3 The pipeline of the infusion system is blocked by the impurity, take down the silicone tube, clean the inwall of the pipeline .

8.4.4 The long needle of the cleaning head cannot touch the bottom of the wells of the microplate. Check the distance between the long needle and the bottom of the wells, whether it is too large, if so, please adjust the distance according to chapter of section 5.2.

8.5 During every washing, the liquid injected from the short needle of the cleaning head to the wells exceed the standard quantity.

8.5.1 Check with the two methods introduced above.

8.5.2 Pressure controlled valve is too tight, and the pressure is too high in the wash bottle. Start the instrument to make it working, loose the nut on the pressure valve needle, regulate the valve and check the liquid volume out of the cleaning head until the volume falls into the normal

range.

8.5.3 The distance between the long needle of cleaning head and the well surface of the microplate is too large. Refer to section 5.2, adjusting the distance between the cleaning head and the well surface to 1mm.

8.6 The short needle keeps draining when the instrument is working.

8.6.1 Solenoid valve failed working, please contact the manufacturer.

8.7 After the instrument starts, the nozzle behind it sprays water or the leakage occurs at the instrument bottom.

8.7.1 There are waste liquid in the vacuum bottle. It is sucked into the vacuum pump and sprayed along the positive pressure pipeline. Shut down the instrument immediately. Pour away the waste liquid of the waste bottle and vacuum bottle, then connect the the waste bottle and vacuum bottle (wash bottle could not be connected at the moment) then restart the instrument, do a no-load running, to guarantee no waste liquid is found in the vacuum pump.

Warming: Vacuum pump cannot be immersed in waste liquid for long time, as it will corrode the components inside the pump and damage the vacuum pump.

8.7.2 Positive and negative pressure tube of the instrument connection error results in the wash buffer sucked into the pump; Check whether

the connection of the pipe is correct one by one, according to the instruction manual.

8.8 The location of the cleaning head and microplate is not correct, and the cleaning head and the tray move inflexible.

8.8.1 The microplate does not slot into the groove of the tray completely. Reset the microplate, to make the bottom of the microplate and the bottom of the tray fully contacted, lay flat.

8.8.2 The inner vertical components between screw rod and nut, as well as between vertical axis and lead rail, may be blocked by impurity or lack of lubricant. Unplug the power plug and open the upper cover of the instrument, using absorbent gauze with coal oil to clean the vertical screw rod, vertical axis and lead rail, and add some lubricant.

8.8.4 The electrical machine rotates, while the horizontal and vertical parts keep still, that’s due to the synchronous belt and synchronous gear loosened.

8.9 After the instrument starts, the cleaning head and the bracket do not stop.

8.9.1 The cable of limit optocoupler is broken and doesn’t work. Unplug the power plug and open the upper cover of the instrument, check whether the horizontal optocoupler cable and vertical optocoupler cable

are broken or not, or is disconnected; fix the optocoupler plug, or replace the optocoupler cable.

8.9.2 The optocoupler is damaged, replace the optocoupler plate.

9、Maintenance Service

9.1 Manufacturer could provide one-year warranty if the damage is not caused by user; After the warranty expires, user can purchase contract service for the instrument.

9.2 During the warranty period, it is not allowed to dismount the component unless it is described in the instruction manual , or else, the maintenance fee will be charged to the user even though within the warranty period.

9.3 If the user would like to repair by themselves, the qualified technician should be called in; however, the manufacturer would not be responsible for the quality of the instrument after repairing, as well as the safety of the maintenance personnel.

9.4 If the customers need to purchase the components or repair the instrument, please contact the service department of the manufacturer.

10、Attachment

1、Rubber tube 1

2、Cleaning head (8/12 needles) 1

3、Nozzle cleaner 2

4、Reagent bottle (standard) 4

5、Instruction manual 1

6、Certification 1

7、Warranty card 1

8、Power line 1

9、Fuse

User could purchase the components beside of the above ones.

1、Stepping motor

2、Vacuum pump

3、Table PC

4、The second, the third valve

5、Switching power supply

6、Circuit board and the related components