

# Instructions

## Densimeter scale

### mod. 2-0490-0-0



Before using this instrument, please read the instructions carefully.

Please keep the manual for reference.

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# 1. INTRODUCTION

The TWS-300K precious metal purity tester is developed using the principle of gravity and a unique software program. In addition, the display screen is adopting a touch mode operation method.

The operation is not only simple and fast to calculate gold karats, density and purity, and other metals; but also, you can distinguish the real precious metal and the fake metal by measuring the density of the sample.

## 1.1 The important notices when operating TWS-300K

The measurement results will be incorrect in these situations:

- When the sample has voids and air cannot be excluded.
- When many bubbles, dust, dirty things adhere to the sample.
- When the metallic mineral whose density is almost equal to that of the sample adheres to the sample surface. (gold = tungsten = 19.32)
- To measure accuracy, situations should be taken into account as follows:
  - Make sure the accessories are installed correctly by following the instruction manual.
  - Do not measure the sample in a place with wind or vibration.
  - The main body should be placed on a flat place.
- Do not use corrosive solutions when measuring the medium.
  - You can use alcohol.
- To measure accuracy, please use the calibration weight to calibrate before operation.
- Gold karats and % purity are calculated by density value.
- When operating the instrument, be aware of the following situations:
  - When you measure the weight in water, please use tweezers when you put the sample in water, don't throw it into the water, or the water will spill on the machine, damage the main board and load cell.
  - The water tank should be cleaned and the plug should be removed if it is not used.
  - Do not measure the sample above the maximum weight.
- It will cause buoyancy if oil or bubbles adhere to the sample, and that will cause the measurement result to be wrong.

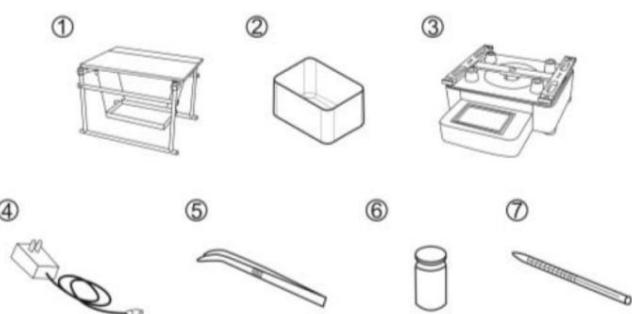
You can drop some neutral cleaner in the water; It can help remove oil and bubbles.

# 2. STANDARD ACCESSORIES

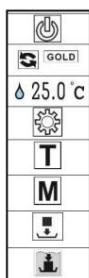
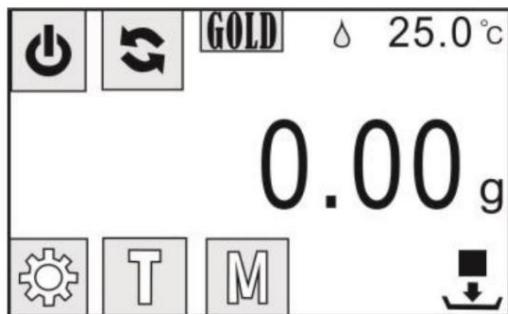
Please check all the accessories in the packing box before using.

The accessories are as follows:

1. Support with basket
2. Water tank
3. Machine body
4. AC adapter
5. Tweezers
6. Weight to calibrate
7. Stylus



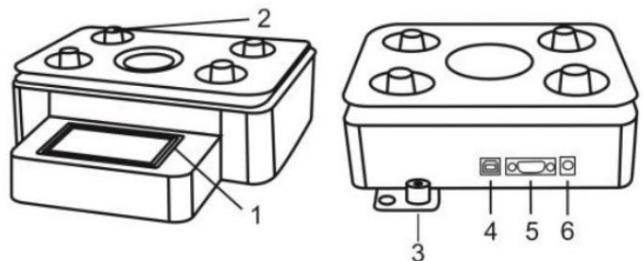
### 3. MAIN SCREEN



- Power off key: press >5 seconds.
- Measurement mode option key.
- Temperature and solution setting value and compensation.
- Program configuration key.
- Zero reset key.
- Memory key.
- Guide symbol for measuring sample weight in air.
- Guide symbol of measuring sample weight in water

### 4. INSTALLATION

- 1 - Touch screen.
- 2 - Infrared temperature sensor.
- 3 - Air bubble.
- 4 - USB connection.
- 5 - RS-232 connection.
- 6 - Power socket.



#### 4.2 How to set up the tester

When choosing a location to set up your tester, you should observe the following: 1. Avoid placing the tester near the heater or exposing the tester to heat or direct sunlight.

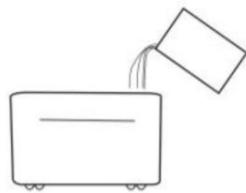
2. Protect the tester from drafts coming from windows or doors open.
3. Avoid exposing the tester to extreme vibrations during measurement.
4. Do not expose the tester to extreme humidity for long periods of time.
5. You have to avoid static electricity.

### Step by step installation:

1. After placing the main body, rotate the 4 feet of the body; adjust the air bubble is centered at the rear of the body.



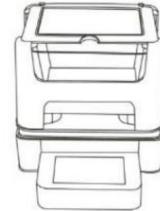
2. Pour the pure water into the water tank up to the line internal.



3. And then put the water tank on the bracket.



4. Place the sensor in the sensor holder and make sure Make sure the bottom of the sensor is embedded in the bracket.



5. When the measuring pan sinks into the water, use the tongs by shaking it to remove bubbles. If bubbles adhere to the measuring tray.

**The measurement result will be incorrect if oil or bubbles adhere to the measurement pan or sample; some cleaner can be added to remove oil or bubbles.**

## 5. HOW TO TURN ON AND OFF

1. How to turn on: the tester will be turned on by touching the screen once.
2. How to turn off: the tester will be turned off by touching and holding > 5 seconds.
3. Warm-up time: To ensure accurate results, the Density Tester Touch screen should be warmed up for 30 minutes before operation.

## 6. Program mode switch application

**The TWS-300K balance has four functions and they must be chosen before measuring.**

1. Gold purity measurement mode---- gold purity measurement.
2. Platinum purity measurement mode---- Platinum purity measurement.
3. Alloy purity and density measurement mode 1---- purity measurement of others precious metals.
4. Alloy purity and density measurement mode 2---- Others purity measurement precious metals.

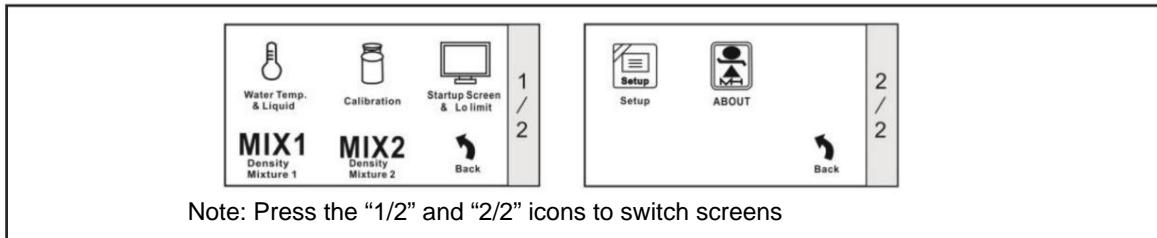
The measurement mode will be changed by touching  key on the main screen.

The program cycle is as follows:

- ÿ Gold purity measurement mode
- ÿ Platinum purity measurement mode
- ÿ MIX1 Measurement mode of purity and density of alloy1
- ÿ MIX2 Measurement mode of purity and density of alloy2.

## 7. Program settings

When the main screen shows 0.00 g, touch the program key.  to enter the settings  
The image will be displayed as follows:



	Setting temperature compensation and solution. (see 7.1)
	Calibration weight (see 7.2)
	Home screen High and low limit of solid density display settings. (see 7.3)
<b>MIX1</b>	Mix1 for alloy density and purity measurement adjustment. (see 7.4)
<b>MIX2</b>	Mix2 for alloy density and purity measurement adjustment. (see 7.4)
	Set the backlight brightness, RS-232 and USB mode settings, and warning beep settings for upper and lower specific gravity limits. (see 7.5)
	Show product information.

## 7.1 Temperature compensation setup and solution



When using water as a measurement solution, the specific gravity of the water depends on the water temperature, the specific gravity of the sample also depends on the water temperature; the resolution of specific gravity is equal to 1,000 when the water is at 4°C in theory.

But in reality, the water temperature cannot be kept at 4°C. Therefore, we have 3 types of configuration for temperature compensation and solution:

### A. INLET TEMPERATURE (manual setting of temperature compensation)

The special feature of TWS-300K has already memorized the specific gravity value in the body from 0°C to 80°C, we just need to use a thermometer to measure the actual water temperature, and then enter it into the setting, at the same time, it will make the compensation of temperature.

### B. AUTO TEMP (automatic temperature compensation setting)

The machine's built-in infrared temperature sensor will automatically detect the water temperature and also make compensation.

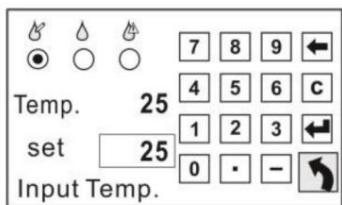
### C. LIQUID (solution compensation adjustment)

When special materials are measured, other liquid media is needed as the measurement solution, and then the density of the liquid medium needs to be input to perform solution compensation.

#### 7.1.1 How to do temperature and solution compensation?

1. In the program setting screen, touch the solution and to make the configuration temperature compensation key.
2. To choose the way of temperature compensation and solution, touch **Input Temp –Auto Temp–Liquid** and the display will show the symbol which means that the compensation has been chosen.
3. **Liquid** and the display will show the symbol which means the compensation has been chosen.

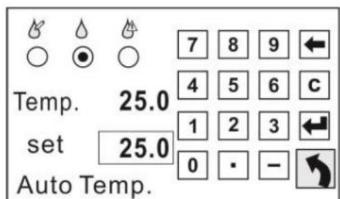
#### A. INLET TEMPERATURE (manual temperature compensation setting)



- 1- Touch C key to clear the value first, and then, input the temperature in numbers 0-9 to input the worth; after finishing it, touch the key to for memorize it.
- 2 - After finishing the memory, touch the key to return to the program setting screen.

#### B. AUTO TEMP (automatic temperature compensation setting)

At this time, the temperature on the screen is the water temperature detected by the infrared temperature sensor. If the actual temperature is different from the displayed temperature, the temperature sensor can be calibrated.



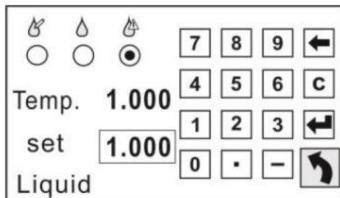
1- Touch C key to clear the value first, and then, input the actual temperature in numbers 0-9 to input the value; after finishing it, touch the key to memorize it.



2 - After finishing the memory, touch the key to return to the program setting screen.



### C. LIQUID (solution compensation adjustment)

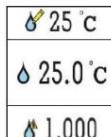


1- Touch C key to clear the value first, and then, input the liquid density in numbers 0-9 to input the value; after finishing it, touch the key 2- After finishing the memory, touch the key to program setting screen.



to come back

After finishing the setting, please return to the main home screen, the top right of the main screen will show the setting mode.



Choose to manually enter a temperature value.

By choosing infrared temperature sensor, perform water temperature compensation automatically.

Choosing solution compensation

## 7.2 Calibration

Density measurement is based on weight calculation; therefore, the accuracy of the measurement results depends on measuring the weight accurately.

It is necessary to calibrate with weight in the following occasions:

When using the precious metal purity tester for the first time

When the precious metal purity tester has been moved

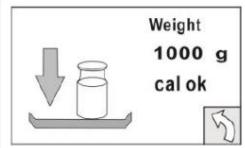
When the location of the surroundings is changed

· As periodic adjustment.

### HOW TO DO THE CALIBRATION

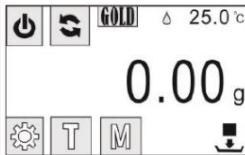
Plug in and preheat for 30 minutes (for cold northern regions)	Monitor 300K
1. The program setting screen is shown as FIG on the left. right. 2. Touch the calibration symbol once and you will enter the calibration program.	
3. It will detect the zero point and perform automatic zero point calibration. call.	
4. When the screen displays the image, place the calibration weight in the sensor sensor. 5. At the same time, the program will detect the weight automatically and do the calibration.	

6. When the calibration is complete, it will display: Cal ok ok.  
 7. Next, remove the calibration weight.



8. Touch program once to return to the setup screen of the key, if you need to continue setting, please choose setting item.

9. If you don't need the setting, touch the home key. to return to the screen

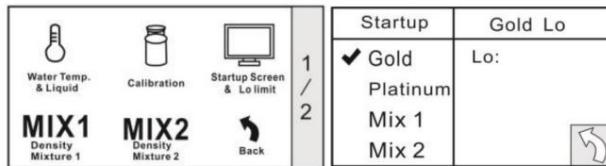


Notice: After calibration, you need to re-calibrate it if the machine is moved to other places.

## 7.3 How to set the home screen and Lo limit

1. TWS-300K has four measurement functions which are Gold, PT, Mix1 and Mix 2.  
 2. It has functions of high limit and low limit of gold karat value and platinum PT value.  
 If it is higher than the high limit, the display will show HI; if it is less than the lower limit, will display LO.

The steps are the following:



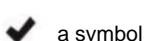
1. Under the picture of program settings, touch the settings key. to perform the

2. If you choose Gold, Platinum, Mix 1, Mix 2, the display screen will show in the image to memorize the chosen start mode.

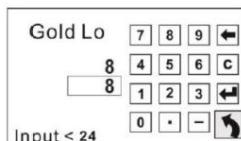
**Gold** - Gold purity measurement mode

**Platinum** - Platinum purity measurement mode

**Mix 1** - Alloy purity and density measurement mode 1 **Mix 2** - Alloy purity and density measurement mode 2

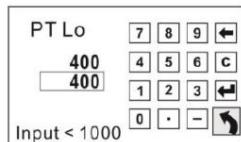


3. If you need to check the low limit value of **gold or platinum**, touch **Lo**, at the same time, the program will enter value review function (as FIG.).



4. The form of the setting value:

Touch **C** key to delete the value, and then touch numbers 0 9 and symbol key to enter the value; After finishing the setting, touch the key to memorize it.



5. Touch the key once to return to the low limit value of the gold and platinum setting screen, if you need to continue setting, please choose the setting item. If you don't need the setting, please touch the program ration key

to return to the setup screen

## 7.4 Configuring the alloy density and purity measurement mode: Mix1 and Mix 2

When a sample includes two or more metallic elements (main metal and secondary metal), the main metal and the secondary metal must be indicated and their density established.

This will display the % purity of the parent metal in the sample and the density of the sample.

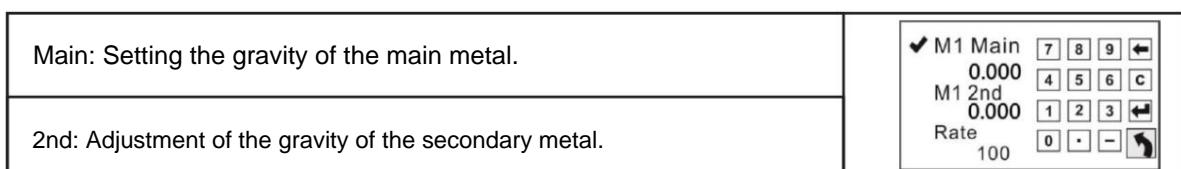
The function suits the following sample or test:

1. Combination of precious metals.
2. Old coins that can be valued or recycled.
3. The material that is supposed to be platinum or silver.
4. Quality inspection of precious metals.
5. The standard materials test.

The test steps are as follows:

1. TWS-300K has two functions of alloy purity measurement mode, and

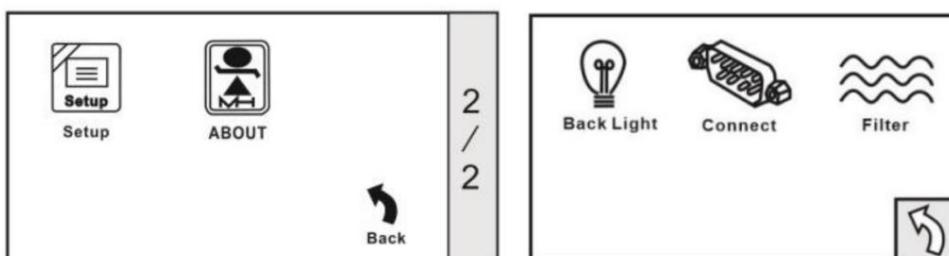
Under the program setting screen image, touch the Mix 1 or Mix 2 key to set the alloy purity and density measurement mode.



Remark: The main metal and the second metal are set to 0.000, which means that the alloy purity measurement mode is closed.

2. If you need to check the item, touch "Main -2nd" and the screen will show what means that the value can be revised.
3. Touch the C key to delete the value, and then touch the numbers 0-9 and the symbol key to enter the value; after finishing it, touch the key to memorize it.
4. After the end of the memory, if you still need to continue to set another value, touch to set the choice item.
5. Touch the key to return to the program setting screen, If you need to continue with the configuration, please choose the configuration item. If you don't need the setting, touch the to return to the configuration screen program key.

## 7.5 Set the backlight brightness, RS-232 and USB mode settings



1. In the program setting screen 2/2, press the **Backlight key**: Backlight brightness setting.  to configure.

- **Connect**: RS-232 and USB configuration mode.
- **Filter**: ambient filter setting.

2. Touch the setting photo for easy setting, after finishing the setting, touch this symbol, then it will reboot back to main setting. 



#### Backlight: Setting the brightness of the backlight.

1. After finishing the setting, tap "ok".

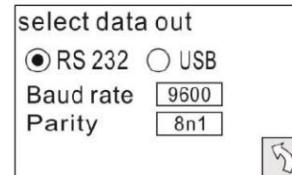
#### Connect: The RS-232 and USB configuration mode.

1. Touch the symbol to make setting (as FIG ).

It has RS-232 or USB you can choose.

> The **RS-232** configuration is:

Baud rate: 9600. Parity: 8n1.



After finishing the setting, touch the symbol When you choose the USB  to return to the last page. you need to plug in the power first, after that, connect the USB cable line, then it can be used.

#### Filter: Ambient filter setting.

1. Touch the symbol to make setting (as FIG ).

Fast: Use in a very good environment.

Medium: Use in ordinary environments. (Default value)

Slow: Use in a place where the environment is a little worse.

2. After setting, tap "ok".

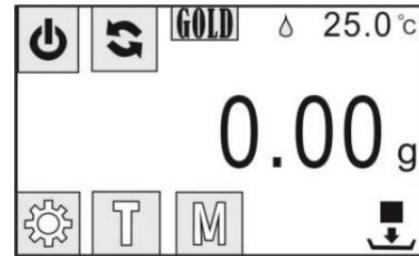


## 8. Measurement mode

### 8.1 Weather

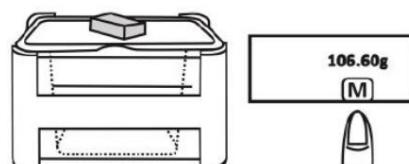
1. Turn on the power, the display will show 0.00 g and the you can start the measurement. If the value does not have to be tared, touch the T key to reset it to zero.

2. At this time, it will display the guide symbol to measure the weight in the air  in the lower right corner.



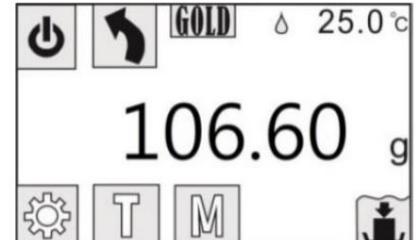
3. Place the sample on the sensor carefully, the weight will be will show on the screen.

4. After displaying the stable symbol "g", touch the key  to memorize the weight of the sample in air.



5. After the air weight is memorized, at this time, will display the guide symbol for measuring weight in water in the lower right corner. 

If an error occurs while measuring the weight of the sample in air, touch the key to return to the last step. 



6. Remove the sample and, using tweezers, place the sample in the measuring tray in water. (Gently shaking will remove any bubbles that stick to the sample.)

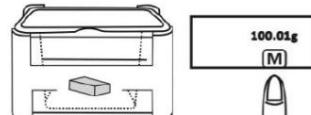


7. If the bubbles cannot be removed, a little alcohol can be poured into the other cup of water, and then place the sample to remove the bubbles.

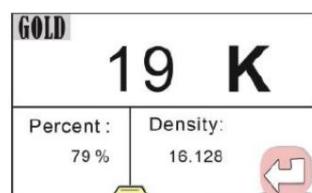


8. After displaying the stable symbol "g", touch the key to memorize the sample weight in water.

**M**



9. View the K value, purity and density of the sample. (For a detailed explanation, please read the description below showing the measurement results.)



Use 1:

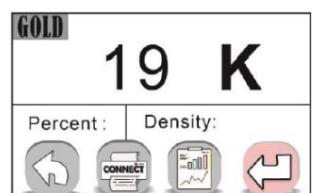
Play the At the bottom of the screen, there will be three function options.



The screen analyzes more gold data.

Print the data on the external printer.

If there is an error in the measurement of the weight of the sample in water, it can be returned to the previous step.



10. Use the tweezers to check the water sample.  
11. Continue with the next sample.



The sample should be dried for 5 minutes if it needs to be retested.

The water in the water tank should reach the marked line.

## 8.2 Show measurement result

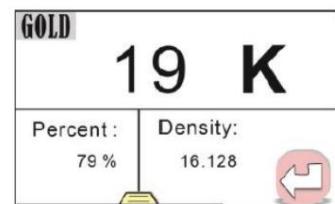
**Gold - Result of the gold purity measurement mode.**

**GOLD** – Gold purity measurement mode.

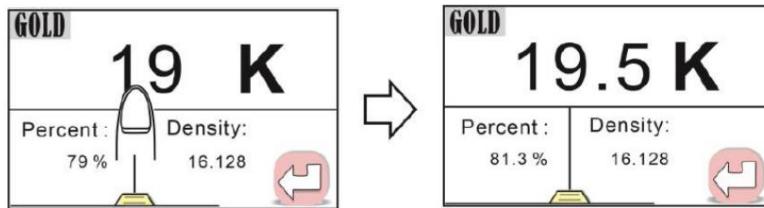
**K:** Karats of gold, silver and copper alloy.

**Percent:** Purity of gold, silver and copper alloy in %.

**Density:** Gold, silver and copper alloy density value.

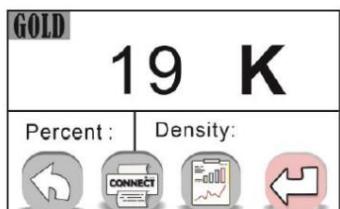


## Use 1:



- Touch the K number data to change the data to high precision.
- Touch the square on the top left GOLD mode to switch to different measurement modes to analyze purity.
- Touch  to return to the test screen.

## Use 2:



- Touch  At the bottom of the screen, there will be three function options. to Touch the key  analyze more gold data.

The detail as follows:



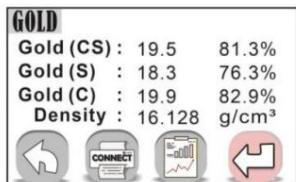
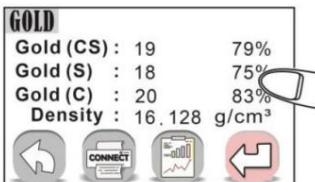
The screen analyzes more gold data.

Print the data on the external printer.

If there is an error in the measurement of the weight of the sample in water, it can be returned to the previous step.

Gold (CS) : 19	79%
Gold (S) : 18	75%
Gold (C) : 20	83%
Density : 16.128 g/cm <sup>3</sup>	

Touch the value data to switch to high precision.



Gold (CS): Carats and purity of gold, silver and copper alloy.

Gold (S): Carats and purity of gold and silver alloy.

Gold (C): Carats and purity of gold and copper alloy.

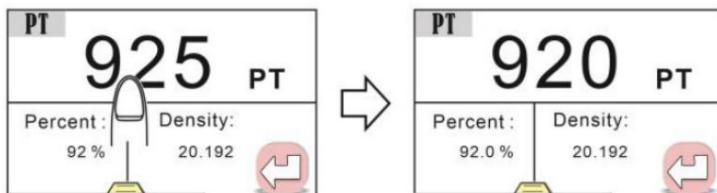
Density: Density value.

**PT - Platinum purity measurement mode result****PT** - Platinum purity measurement mode

Directly display the PT value, purity and density of the sample.

**PT**: PT made of platinum and palladium alloy.**Percent**: Purity of platinum and palladium alloy.**Density**: Density of the platinum and palladium alloy.

Use 1:

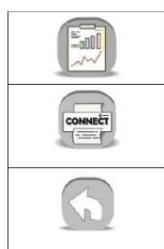


- Touch the PT number data to change the data to high precision.
- Touch the square in the upper left PT mode to switch to different measurement modes to analyze purity.
- Touch  to return to the test screen.

Use 2:



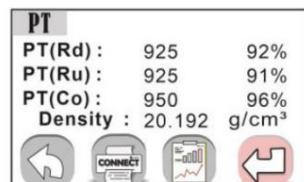
- Touch  At the bottom of the screen, there will be three function options. to Touch the key  analyze more gold data.
- The detail as follows:



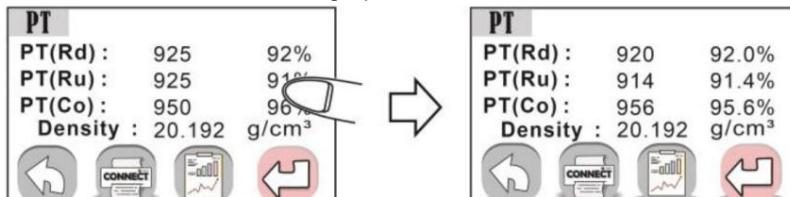
The screen analyzes more gold data.

Print the data on the external printer.

If there is an error in the measurement of the weight of the sample in water, it can be returned to the previous step.

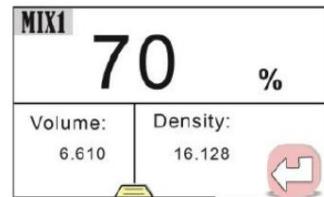


Touch the value data to switch to high precision.

**PT (PD)**: Value of PT and purity of platinum and palladium alloy.**PT (Ru)**: Value of PT and purity of platinum and ruthenium alloy.**PT (Co)**: PT value and purity of platinum and cobalt alloy.**Density**: Density value.

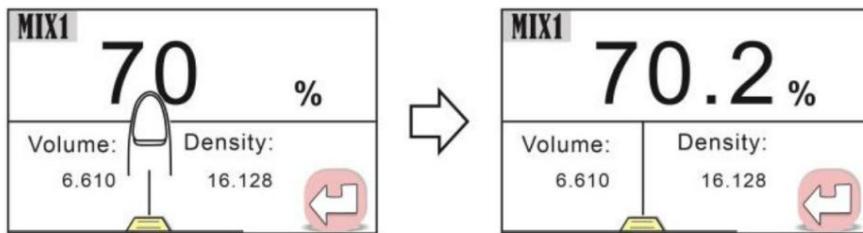
**MIX 1 - Alloy 1 purity and density measurement mode result:****MIX 1** - Alloy purity and density measurement mode 1:

It directly displays the percentage, volume and density of the sample.

**Percent:** Alloy purity.**Volume:** Volumetric value of the alloy.**Density:** Density value of the alloy.

Remake: You need to set the Mix 1 program value, and then, the measurement mode can be displayed.

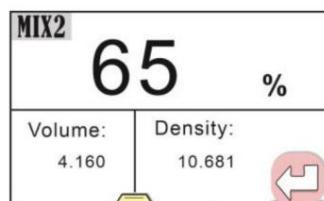
Use 1:



- Touch the data to change the data to high precision.
- Touch the square in the upper left MIX1 mode to switch to different modes of measurement to analyze purity.
- Touch to return to the test screen.

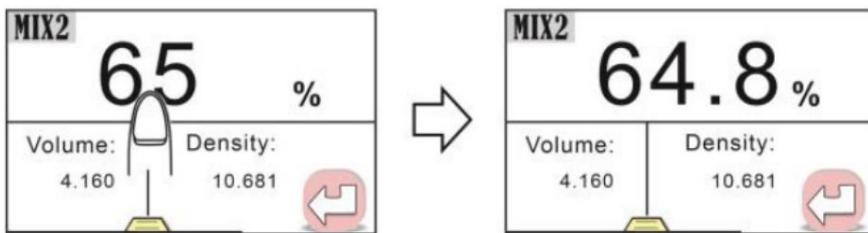
**MIX 2 - Result of alloy density and purity measurement mode 2:****MIX 2** - Alloy purity and density measurement mode 2:

It directly displays the percentage, volume and density of the sample.

**Percent:** Alloy purity.**Volume:** Volumetric value of the alloy.**Density:** Density value of the alloy.

Remake: You need to set the Mix 2 program value, and then, the measurement mode can be displayed.

Use 1:



- Touch the data to change the data to high precision.
- Touch the square in the upper left MIX2 mode to switch to different modes of measurement to analyze purity.
- Touch to return to the test screen.

### 8.3 The following situations may cause the display to show LO.

1. The PT and Carat value of the sample is less than the lower limit of the PT and Carat value of gold set by the user or the sample is false.
2. The same sample needs to be measured due to operation error (sample needs to be dried before re-measuring).
3. When measuring rings with gemstones, the density and purity will be less than the value real.
4. TWS-300K cannot measure the hollow sample.
5. The sample is attached to many bubbles.

## 9. Error code

error display	Error Reason (R) / Description (D)
On...wait.	A: Reading the program error. D: Motherboard error.
When the screen cannot be displayed after start up.	A : The screen cannot be displayed. D: 1. Check whether the transformer is abnormal. 2. Display error.
AND	A: This is a warning that a weight greater than the capacity of the scale has been placed on the pan. D : 1. Remove the weight from the tray. 2. Load cell failure.
L	A : The accessories of the hydrometer are not installed. D : Relocate the density tester accessories.
-AND	A : This is a warning that a weight value is too low. D: Load cell failure.
Over Load	A : This is a warning that a weight greater than the capacity of the scale has been placed on the pan. D : 1. Remove the weight from the tray. 2. Load cell failure.
Weight Error	A : The operation steps are wrong. D : Re-measure.
The calibration weight is different from the value of calibration	A : This is a calibration error. Ex: put a calibration weight of 100 g, but it shows CAL 90. D : 1. Need to do internal weight calibration, please contact MatsuHaku agent. 2. Load cell failure.

## 10. Notes for proper operation

1. The electronic densitometer belongs to an accurate electronic densitometer; please assign a specific person to be responsible for management and operation.
2. If water and other liquids are spilled from the container by carelessness during the measurement of the density, please notify the director in time, or it will delay the repair time.
3. Please make sure that if the machine is in the condition of being submerged or has any fault, Before going out of service every day, the manager should check it to make sure the display can show 0.00g, if it shows abnormal, it means the machine has broken down.
4. What to do if the body is flooded?  
Cut off the power first and turn over the body, dry it. Please notify the professional maintenance staff of the sellers to check and maintain it. Please do not disassemble it yourself or it will damage the load cells.

## 11. Maintenance

1. The machine cannot measure objects over the maximum weight and should avoid loading the shows above the maximum weight during the process of installation or operation.
2. The surface of the machine should be cleaned with a dry cloth, avoid the accumulation of dust.
3. Remove the sink and power supply, and then cover it with a dust cover if the machine is not used for a long time.
4. The machine should avoid shock, squeeze and humidity.
5. When cleaning the sensor, please do not wipe the measuring pan vigorously, or it will cause the hanging lines from twisting and distorting. If the dangling lines are tortuous, change them to thousand.



## 12. Density tables

Weather	Ratio	Alloy		density range
		copper and silver		
K24	1000/1000	19.32		19.13~19.51
K22	916/1000	17.73		17.45~18.24
K20	834/1000	16.42		16.03~17.11
K18	750/1000	15.24		14.84~16.12
K14	584/1000	13.38		12.91~14.44
K10	417/1000	11.91		11.42~13.09

Platinum	Ratio	Alloy		density range
		Nickel	Palladium	
Pt.1000	1000/1000		21.45	21.24~21.66
Pt. 950	950/1000	20.04	20.64	19.84~20.85
Pt. 900	900/1000	18.80	19.88	18.61~20.08
Pt. 850	850/1000	17.71	19.18	17.53~19.38
Pt. 800	800/1000	16.73	18.53	16.56~18.72
Pt. 750	750/1000	15.86	17.92	15.70~18.10

### Precious metal density

Element	Density (20°C) g/cm <sup>3</sup>
Weather	19.32
Platinum	21.45
The payment	10.5
Born	12.44

### Alloy Metal Density

Element	Density (20°C) g/cm <sup>3</sup>
Copper	8.93
Nickel	8.90
Cobalt	8.85
Rutenio	12.41
Palladium	12.02

### Density of other metals

Element	Density (20°C) g/cm <sup>3</sup>
Aluminum	2.7
Steel	7.87
Lead	11.36
Tantalum	7.3
Zinc	7.1
Titanium	4.51

### Density of other alloys

Element	Density (20°C) g/cm <sup>3</sup>
925 payment	10.40
silver coin	10.35
K14	14.82