

# **ATO**

## **Benchtop Solid Density Meter**

### **User Manual**

## Principle

Direct reading density meter SJ-300G / SJ-600G is based on GB/T533, ISO2781, ASTM D297-93, DIN 53479, ASTM D792, D618, D891, ISO1183, GB/T1033, ASTM D792-00, JISK6530, ASTM D792-00, JISK6530 and adopts the principle of Archimedes' water displacement method.

## Purpose

This machine is mainly used in industries such as rubber, plastic, wire and cable, food, composite materials, cosmetics, shoe materials, glass, precious metal hardware recycling, etc. It can directly read the average weight of solid, granular, film, floating, powdery samples in air, average weight in water, density value, and volume.

## Instrument Description







Model	SJ-300G	SJ-600G	SJ-300GT	SJ-120GT
Measuring range	0.01~300g	0.01~600g	0.005~300g	0.001~120g
Apparent density analysis	0.001g/cm <sup>3</sup>	0.001g/cm <sup>3</sup>	0.0001g/cm <sup>3</sup>	0.0001g/cm <sup>3</sup>

### 1. Components



- ① Density meter host    ② Density measurement table    ③ Water tank  
④ Calibration weight    ⑤ Anti-floating frame    ⑥ Tweezers  
⑦ Stainless steel tennis ball    ⑧ Glass cup    ⑨ Power supply

## 2. Control Panel

	Control the power on and off of the instrument
	232 communication/drive micro printer to print out measurement data
	Measurement data conversion display
	Memory data
	Long press: set machine parameters Short press: return function
	Long press: enter the calibration function Short press: weight value reset to zero

## 3. How to Install SJ-300G/ SJ-600G

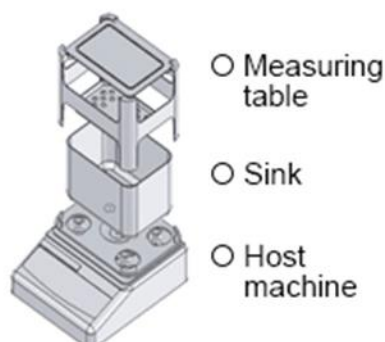
### 1). Installation precautions

To ensure that the density meter measures correctly, keep the density meter in good condition and avoid danger, please pay attention to the following:

- Do not install the density meter in dusty, windy, vibrating places, places with large temperature and air pressure changes, or places with magnetic fields.
- Do not place the densitometer on an unstable surface that could cause level changes.
- Do not place in direct sunlight.
- It should not be placed near heaters or air conditioners.
- It is not suitable to use unstable AC power supply.
- It should not be placed in places with flammable, explosive or corrosive gases.
- Before use, please adjust the balance temperature to keep it consistent with the ambient temperature.

### 2). Installation steps

(1). Adjust the four legs to make sure the main unit is in a horizontal position and that the sensor platform and the water container support are not in contact.



(2). Add distilled water (enough to cover the tested product) and place it on the water container support.

(3). Place the measuring table on the sensor platform and make sure that the bottom of the measuring table is correctly placed on the sensor platform and the measuring fence is sunk in the water. If there are bubbles attached to the measuring fence, use a burette to remove the bubbles.

**Note:** When installing the density measuring table, you must firmly support the tray below and then put it on to prevent excessive force from damaging the sensor.

**3). Warm machine:** power supply condition, AC 100V, 50Hz or 220V, 60Hz

(1). This instrument is a density device. After plugging in and turning on the power, it takes about 30 minutes for the machine to reach a stable state. Once this process is completed, turn off the power in real time, and the density circuit will remain stable.

(2). If "—————" cannot be converted to 0.000g/0.00g, this means that the zero point has drifted or there is wind. Press the zero key to make the display 0.000g/0.00g. If it cannot be converted to 0.000g/0.00g, please recalibrate. (Please refer to the calibration section)

## 4. Calibration

Situations where calibration weights are required:

- When the apparent density tester is used for the first time
- When the apparent density tester is moved to another place
- When the surrounding environment changes
- Regular adjustment

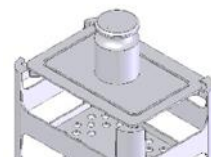
Plug in the power supply and warm up for 30 minutes (for colder areas in the north). The display shows 0.000g

(1). When the tester is in weighing mode, press and hold ZERO. key.

(2). When CAL is displayed, let go and the calibration procedure will begin:

When you see the weight flashing on the screen, followed by "300.00g" flashing, (**Note:** the calibration value displayed at this time is only used as a reference calibration value. The user can select any weight of the linear calibration point on the weighing pan according to actual needs.

The program will automatically determine the weight value and complete the calibration) put the calibration weight on the weighing pan, the displayed value flashes faster, until the value stops flashing, then remove the weight. Calibration is completed.



## 5. Temperature and solution compensation settings

When using water as a measuring solution, the tester can measure the apparent density of the sample to water. The measured apparent density value changes according to the change of water temperature. Therefore, it needs to be temperature compensated based on the apparent density of water at 4°C, which is 1.0000. For the temperature compensation coefficient of water, the machine has stored the memory value of 0~ 100 degrees Celsius. It can set the apparent density value of the sample according to the water temperature.

In Air mode, long press the "SET" key to enter the measurement parameter setting. Press the "SET" key to modify the setting parameters, press the "PRINT" key to set the parameter shift, press "ENTER" to enter the next setting, and press the "ZERO" key to exit the setting mode.

Setting item menu function table:

Project	Parameter	Description
DDo	0000	Density lower limit
DUP	0000	Density upper limit
°C	00.0	Current water temperature
UDE	0.0000	When using other liquids as the measuring medium, the density of the other liquids
LIT	0/1	Use distilled water as the measuring medium/ Use other custom liquids as the measuring medium

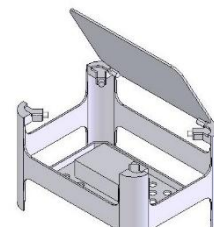
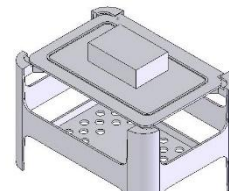
## 6. Measurement steps

Weight required for correct density measurement: SJ-300G calculates density based on Archimedes principle. To avoid errors, the greater the density, the heavier the weight required. Please refer to the following table and prepare enough sample weight.

Density value	0.2	0.4	0.60	0.80	1.00	1.20	1.40	1.60	1.80
Weight (g)	0.16	0.62	1.41	2.56	3.93	5.65	7.70	10.10	12.70
Density value	2.0	2.2	2.40	2.6	2.8	3.000	3.5	4.0	4.5
Weight (g)	15.7	19.0	22.7	26.6	30.9	35.4	48.2	62.9	79.6
Density value	5.0	5.5	6.0	6.5	7.0				
Weight (g)	98.3	118	141.6	169.9	200				

### A: Solid

- (1). Turn on the computer
- (2). The display will change from  $\text{-----}$  to 0.000g. If it is not 0.000g, press Zero key returns to zero.
- (3). The status display area displays "AIR" (if the user has connected a digital temperature sensor, the status display area automatically displays the current temperature). Place the sample on the measuring table at zero point and press Enter after it stabilizes. "SAV-A" is displayed, indicating that the weight value of the sample in air has been recorded.



(4). At this time, the status display area shows "LIq". Put the sample into the water hanging railing, and press the Enter key after it stabilizes. Calculate the average weight in the water and memorize it.

(5). The screen directly displays the density value. Press the MODE key to switch between density and volume. Press the SET key to enter the next sample test. (Press SET during the test to return to the previous step.)

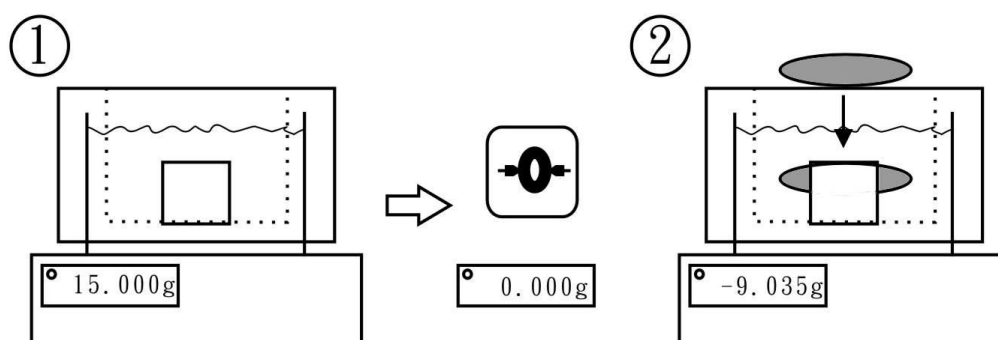
## B. How to measure floating bodies in water

You can use the anti-floating frame to measure floating bodies without having to prepare a medium solution that is lighter than the apparent density of water.

(1). Place the anti-floating frame on the railing in the water and press the Zero key to deduct the weight.

(2). After obtaining the weight in air, place the sample under the anti-floating frame to prevent the sample from tipping over. If the sample density is less than  $1.000\text{g/cm}^3$ , the sample will be under the anti-floating frame and the weight will show a negative value, indicating a floating body.

(3). Press Enter to calculate the density value.



## C. How to measure particles

Preparation:

(1). Change the liquid medium to alcohol (refer to temperature and solution compensation settings), for example, ethanol has a lower surface tension.

(2). Set the density value of the liquid medium.

(3). Prepare 1 measuring cup and 1 tea ball.

Step:

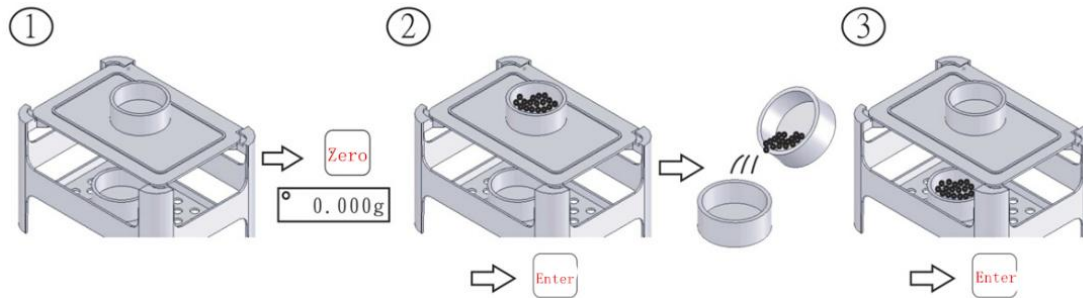
(1). Place a measuring cup on the measuring table and a tea ball on the hanging rail in the water. Press Zero to deduct the weight of the two.

(2). Make sure the display shows  $0.000\text{g}$ , put the particles in the measuring cup (A), and press Enter to memorize the weight in the air.

(3). Take out the tea ball (B) and carefully transfer the granules from the measuring cup (A) to the tea ball (B).

(4). Carefully replace the tea ball (B) and place the measuring cup (A) back on the measuring table.

(5). At this time, the value on the display is the weight of the particles in water. Press Enter to memorize the weight in water and get the apparent density value. Press the MODE key to switch between density and volume, and press the SET key to enter the next sample test.



## 7. Operation precautions

(1) The instrument is a precision density tester. Please designate a dedicated person to be responsible for its management and operation.

(2) If the water or other liquid in the water container is accidentally overflowed when using this density tester, be sure to inform the supervisor in time to avoid delaying the repair time.

(3) To know whether the machine has been soaked in water or has malfunctioned, please ask the supervisor to turn on the machine and check whether the screen can display 0.000g before leaving work every day. If it displays — — — — —, it means the machine has malfunctioned.

(4) What to do if the machine falls into water?

First, unplug the power supply, then turn the machine upside down and dry it in the shade. Immediately notify the professional maintenance personnel to check and repair it. Do not disassemble it by yourself to avoid damaging the load cell.

## 8. Insurance keep

(1) SJ-300G cannot measure objects weighing more than 300g; SJ-600G cannot measure objects weighing more than 600g. Also, avoid subjecting the machine to excessive pressure during installation and use.

(2) The exterior of the machine must be wiped with a dry cloth to prevent dust from accumulating.

(3) If the machine is not used for a long time, the water tank should be removed.

(4) This machine should be protected from collision, extrusion and moisture. If not in use for a long period of time, please remove the power supply and cover it with a dust cover.

## 9. Troubleshooting

(1). Unstable weight:

Troubleshooting method: Remove the measuring table and sink, and check whether there is any foreign matter or water droplets under the support table. If there is any foreign matter or water droplets, please remove the foreign matter or wipe off the water droplets first.

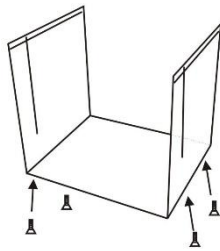
(2) If the number appears ----- or -E

Elimination method: first press  $\rightarrow \bigcirc \leftarrow$ , try to see if it can return to zero stably. If it does not return to zero, first remove the objects on the measuring table, and then contact the relevant personnel to come for repair.

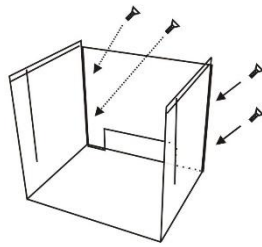
(3) If a fault occurs that cannot be corrected by yourself, do not open the machine without authorization and contact the relevant personnel for repair in a timely manner.

## 10. Windshield Installation

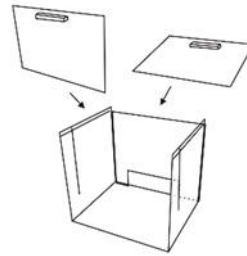
(1). Fix the lower screws



(2). Fix the rear screws



(3). Assembly is complete



Appendix 1: Density comparison table of alcohol at different solubility and temperature

Concentration	20°C	25°C	30°C	Concentration	20°C	25°C	30°C
Temperature				Temperature			
0	0.9982	0.9943	0.9903	42	0.9309	0.9270	0.923
1	0.9965	0.9926	0.9886	43	0.9299	0.9260	0.922
2	0.9948	0.9909	0.9869	44	0.9272	0.9233	0.9193
3	0.9931	0.9892	0.9852	45	0.9252	0.9213	0.9173
4	0.9914	0.9875	0.9835	46	0.9234	0.9195	0.9155
5	0.9896	0.9857	0.9817	47	0.9214	0.9175	0.9135
6	0.988	0.9841	0.9801	48	0.9196	0.9157	0.9117
7	0.9863	0.9824	0.9784	49	0.9176	0.9137	0.9097
8	0.9847	0.9808	0.9768	50	0.9156	0.9117	0.9077
9	0.9831	0.9792	0.9752	51	0.9135	0.9096	0.9056
10	0.9815	0.9776	0.9736	52	0.9114	0.9075	0.9035
11	0.9799	0.9760	0.972	53	0.9094	0.9055	0.9015
12	0.9784	0.9745	0.9705	54	0.9073	0.9034	0.8994
13	0.9768	0.9729	0.9689	55	0.9052	0.9013	0.8973
14	0.9754	0.9715	0.9675	56	0.9032	0.8993	0.8953
15	0.974	0.9701	0.9661	57	0.901	0.8971	0.8931
16	0.9725	0.9686	0.9646	58	0.8988	0.8949	0.8909
17	0.971	0.9671	0.9631	59	0.8968	0.8929	0.8889
18	0.9696	0.9657	0.9617	60	0.8946	0.8907	0.8867
19	0.9681	0.9642	0.9602	61	0.8924	0.8885	0.8845
20	0.9666	0.9627	0.9587	62	0.8902	0.8863	0.8823
21	0.9651	0.9612	0.9572	63	0.8877	0.8838	0.8798
22	0.9636	0.9597	0.9557	64	0.8856	0.8817	0.8777
23	0.9622	0.9583	0.9543	65	0.8834	0.8795	0.8755
24	0.9607	0.9568	0.9528	66	0.8811	0.8772	0.8732
25	0.9592	0.9553	0.9513	67	0.8787	0.8748	0.8708
26	0.9576	0.9537	0.9497	68	0.8763	0.8724	0.8684
27	0.9562	0.9523	0.9483	69	0.8738	0.8699	0.8659
28	0.9546	0.9507	0.9467	70	0.8715	0.8676	0.8636
29	0.9531	0.9492	0.9452	71	0.869	0.8651	0.8611
30	0.9515	0.9476	0.9436	72	0.8665	0.8626	0.8586
31	0.9499	0.9460	0.942	73	0.8641	0.8602	0.8562
32	0.9483	0.9444	0.9404	74	0.8616	0.8577	0.8537
33	0.9466	0.9427	0.9387	75	0.8592	0.8553	0.8513
34	0.945	0.9411	0.9371	76	0.8567	0.8528	0.8488
35	0.9433	0.9394	0.9354	77	0.8542	0.8503	0.8463

36	0.9416	0.9377	0.9337	78	0.8518	0.8479	0.8439
37	0.9398	0.9359	0.9319	79	0.8494	0.8455	0.8415
38	0.9381	0.9342	0.9302	80	0.8469	0.8430	0.839
39	0.9363	0.9324	0.9284	81	0.8446	0.8407	0.8367
40	0.9345	0.9306	0.9266	82	0.8424	0.8385	0.8345
41	0.9327	0.9288	0.9248	83	0.8394	0.8355	0.8315
84	0.8366	0.8327	0.8287	93	0.8119	0.8080	0.804
85	0.834	0.8301	0.8261	94	0.809	0.8051	0.8011
86	0.8314	0.8275	0.8235	95	0.8062	0.8023	0.7983
87	0.8286	0.8247	0.8207	96	0.8034	0.7995	0.7955
88	0.8258	0.8219	0.8179	97	0.8005	0.7966	0.7926
89	0.823	0.8191	0.8151	98	0.7976	0.7937	0.7897
90	0.8202	0.8163	0.8123	99	0.7948	0.7909	0.7869
91	0.8174	0.8135	0.8095	100	0.7917	0.7878	0.7838

## Appendix 2: Density table of water at different temperatures

Temperature	Density	Temperature	Density	Temperature	Density
0	0.99984	30	0.995646	64	0.98109
2	0.99994	32	0.99503	68	0.97890
4	0.99997	34	0.99437	70	0.97777
5	0.999965	35	0.99403	72	0.97661
6	0.99994	36	0.99369	74	0.97544
8	0.99985	38	0.99297	76	0.97424
10	0.999700	40	0.99222	78	0.97303
12	0.99950	42	0.99144	80	0.97179
14	0.99924	44	0.99063	82	0.97053
15	0.999099	46	0.98979	84	0.96926
16	0.99894	48	0.98893	86	0.96796
18	0.99860	50	0.98804	88	0.96665
20	0.998203	52	0.98712	90	0.96531
22	0.99777	54	0.98618	92	0.96396
24	0.99730	56	0.98521	94	0.96259
25	0.997044	58	0.98422	96	0.96120
26	0.99678	60	0.98320	98	0.95979
28	0.99623	62	0.98216	100	0.95836