



HT-F20R Series Mini Capsule/Kcup Filling and Sealing Machine

PLC Operation Manual





Warnings

PLEASE FIRST READ THE OPERATION MANUAL CAREFULLY AND UNDERSTAND ALL SAFETY MEASUREMENTS OF THE MACHINE AND INSTALL THE MACHINE PROPERTY AS REQUIRED BEFORE USING THIS QUICK START MANUAL AND PLC OPERATION MANUAL.

Part 1: PLC Operation Manual

1. Home page

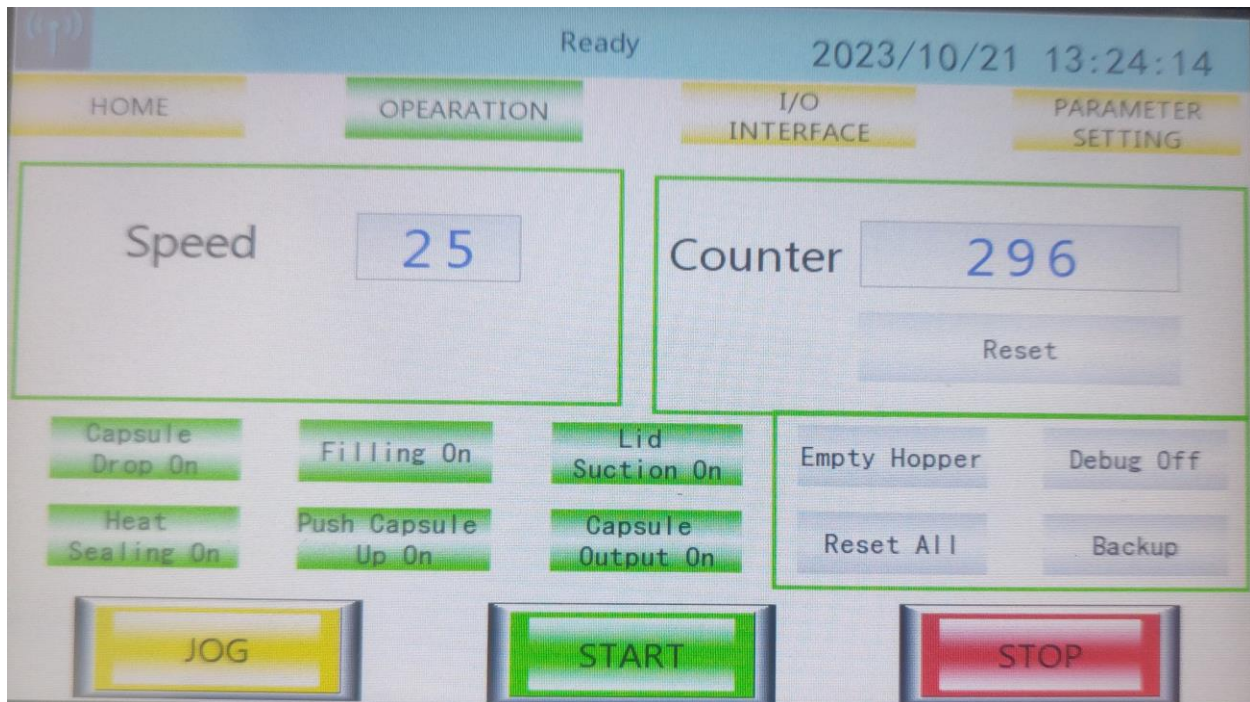
Turn on the power of the packaging machine and connect the air supply. The screen displays the [Home] page. Select the corresponding language.

Initial interface: On the home page of the machine, you can choose language on this screen and switch to other screens.



2. Operating screen

Enter the operation interface page, which is used to control the operation of the machine.



Explanation of each function on this screen:

Operation screen: In green, means you are at Operation screen

Speed: Set up machine speed; please test the best speed for your blend.
Recommended speed: 15-25 capsules per minute, depending on your blends.

Counter: Counts how many cups produced by this machine.

Reset: Reset the counter

Capsule drop off/on: Turn on (in green) to drop the cups, off means no cup will drop

Filling off/on: Turn on filling coffee

Lid suction off/on: Turn on/off to pick the lid on the cups

Heat sealing off/on: Turn on/off to enable/disable heat sealing function. Note: the heating will be on automatically when the machine has power.

Push capsule on/off: Turn on/off to enable/disable the cylinder to push up the cups when it is discharged.

Capsule output off/on: Turn on/off to push the cup out or not

Empty hopper: Empty the hopper when you finish production.

Debug on/off: Turn on this switch to enter into debug mode, in which all sensors are not working, and the customer can test each function one by one.

Reset All: Push this button to let the turntable move back to the original position. **Strongly suggest using this button after emergency stop or debugging the machine before running machine automatically.**

Backup: Empty button for backup.

JOG: Debug the machine manually. **Click the jog button**, the machine and all functions will move a little bit so that the user can watch every movement of the machine. **If long pressing the jog button**, the machine will move to the next workstation, then stop, then move again.

RUN: Start to run the machine.

STOP: Stop the machine. When you push this button to stop the machine, all working stations stop, but the turntable will still move forward to the initial position.

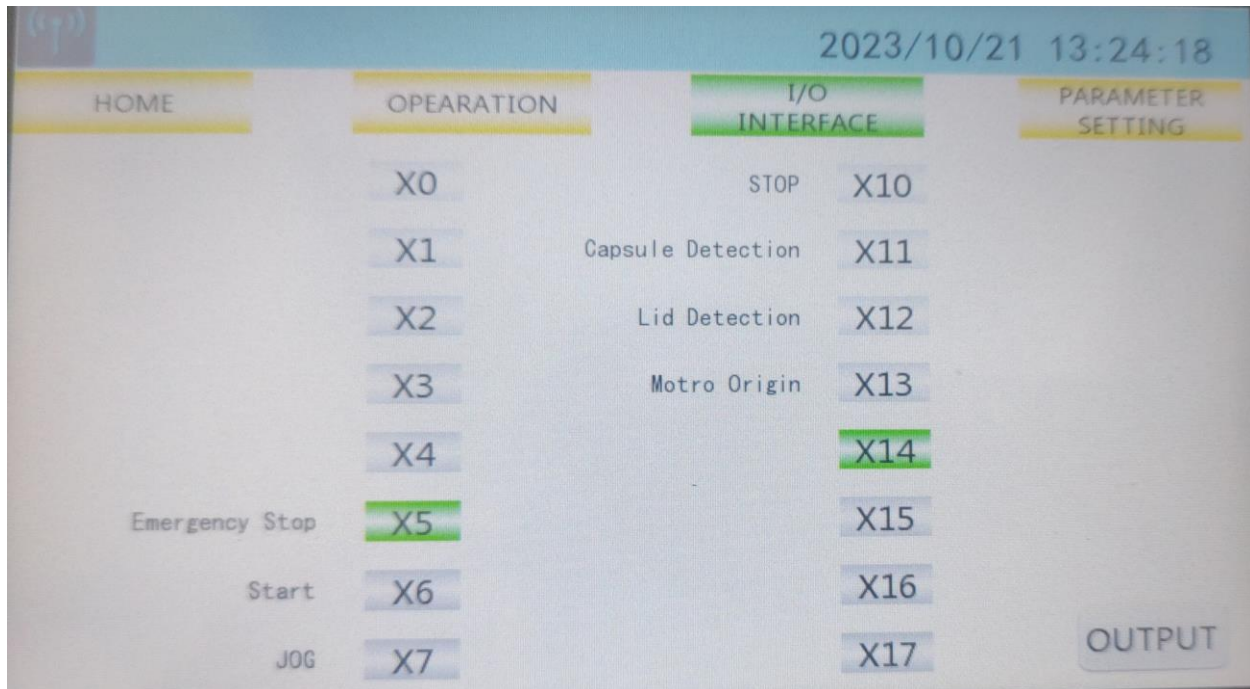
3. IO interface

It is also named debug interface, which is used for debugging the machine when any problems happen, or monitor the machine when working well or not.

Password for IO interface is: 888888

3.1 Input of PLC

In the first screen of IO interface, it shows all input signals to PLC to monitor the status of the machine, and these buttons are not operational. For example, when emergency stop is on, then X5 will turn green.



X5: When turns green = Emergency stop is on

X6: Start on

X7: Jog on

X10: Machine is stopping

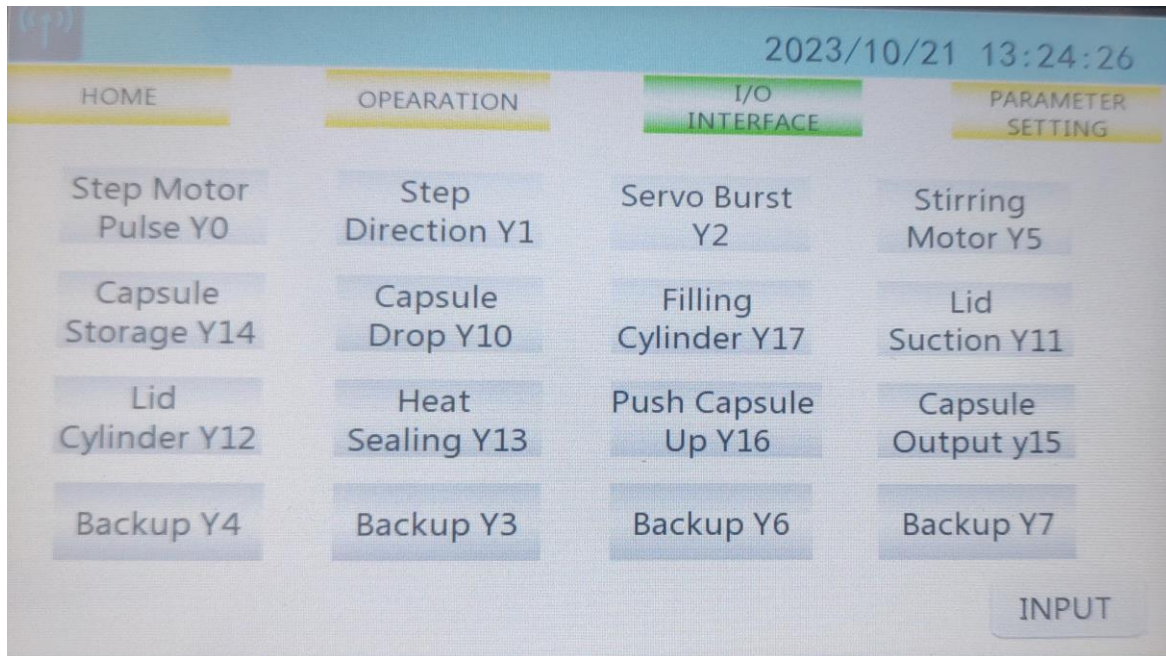
X11: When detects the cups in the turntable



X12: When detects the lids on the cups, as shown in the following picture

X13: Motor Origin, when the machine returns to the origin point

3.2: Output of PLC



In the second page of IO interface, it shows all outputs from PLC which PLC sends out signals to control the machine movements. Y0, Y1, Y2 and Y5 are monitoring the status only too.

- Y0: Shows the status of step motor of the turn table. Green is on and gray is off.
- Y1: Shows the direction of the step motor (the turn table direction).
- Y2: Shows the servo motor to drive the coffee filling screw on or off.
- Y5: Shows the stirring motor is on or not.

From Y10 to Y17, all other buttons are operational, which are most used for debugging the machines. Pushing those buttons could test every movement of every work station. Detailed operations for each work station are referred to <Quick Start Manual>, or 4-4 of chapter 4.

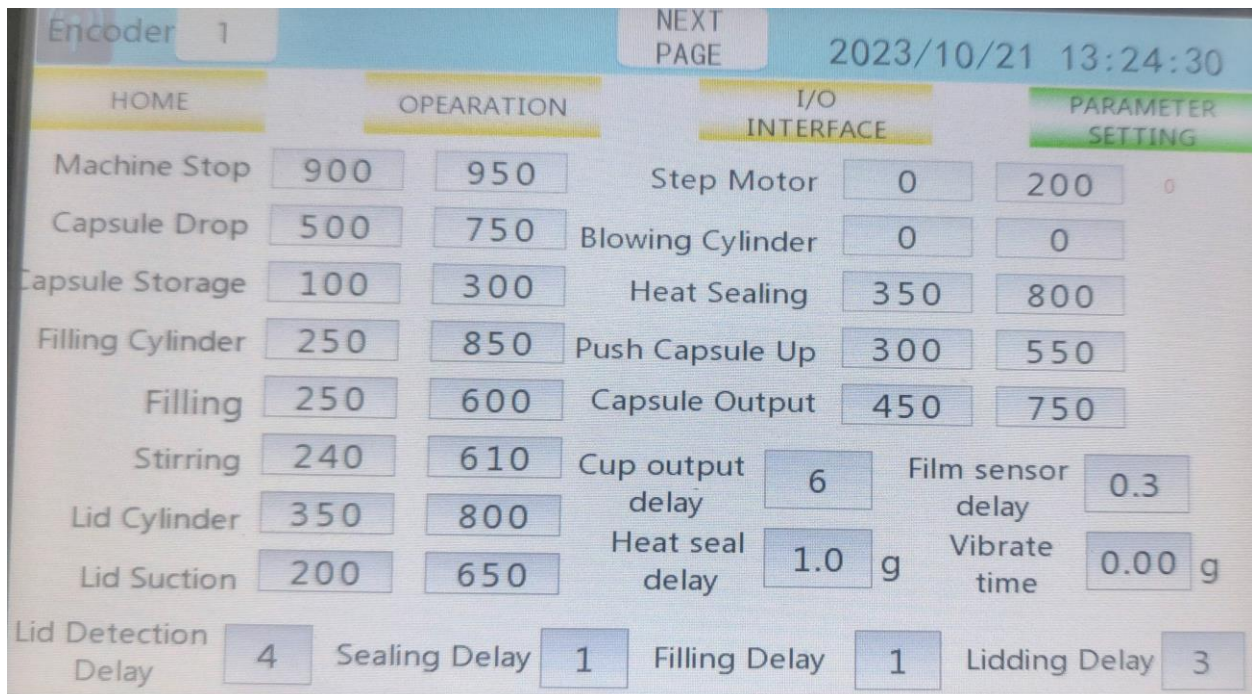
- Y14: Capsule storage: The cylinder holds the cups in the cup silo and when it opens, it will release one cup to Y10 and ready to drop.
- Y10: Capsule drop: When this cylinder works, it will open the holder of the cup silo and let the cup drop down.
- Y17: Filling cylinder: This cylinder will push the cups up when filling the coffee into the cups.

- Y11: Lid suction: Push this button to suck the lid down.
- Y12: Lid cylinder: This cylinder will move the lid sucker up to let Y11 suck the lid, and then turn 180 degree to move the lid sucker down.
- Y13: Heat sealing: Pressing this button to move the heating head down and seal the lid.
- Y16: Push capsule up: The cylinder pushes the cups up and then Y15 push the cups out.
- Y15: Capsule output: It will work with Y16 to discharge the cups.
- Y3/Y4/Y6/Y7: Backup options for future

3.3 Parameter Setting

There are parameters for each movement of the machine in this screen.

Warning: The parameters on this page are the most important for this machine, please DO NOT CHANGE anything unless you completely understand the principles of how the machine runs. Please record this page before changing any parameters.



Parameter setting page-1

Every parameter on this page controls one cylinder, motor, vacuum or sensor to take one action in the machine.

Encoder: _____ This encoder number indicates the current machine position.

The most important device is the encoder inside the machine. It controls and shows the machine position. In the meantime, it works like a timer to control every movement and every procedure of the machine. The encoder number shows the current position of the machine. It is always between 0-999, and after 999, it starts from 0 again. For example, the current machine in the operation page is 1, which the encoder arrives the position 1. The number in the first column is the time to start that procedure, and the number in the second column is the time to stop that procedure.

Machine Stop: Indicate the stop position of the machine. When pressing the stop button, the machine will stop between encoder positions 900-950.

Capsule drop: The cylinder starts to open cup holder at position 500 to release the cup to the turntable and close the holder at position 750.

Capsule storage: The cylinder starts to open cup holder at position 100 to release one cup to the cup holder controlled by the capsule drop cylinder and close the holder at position 300.

Filling Cylinder: The cylinder pushes the cup up when filling coffee at position 250, and return at the position 850.

Filling: The auger fills coffee into the cup from position 250 to 600.

Stirring: The stirring motor runs from position 240 to 610.

Lid Cylinder: The cylinder goes up at position 350 and goes down at 800.

Lid suction: The vacuum sucks the lid from position 200 to 650.

Step motor: The step motor operates from 0 to 200. This is the time when the turn table is turning; all other functions are idle during this time.

Blowing cylinder: The blow cylinder does not work in this machine.

Heat Sealing: The heater seals the lids on the cup from position 350 to 800.

Push Capsule up: The cylinder pushes the cup up from position 300 to 550.

- Capsule output: The cylinder pushes the cups out from position 450 to 750.
- Film sensor delay: When the lid detector detects lids, then within 0.3 second, it won't send signal to detect the lids again to avoid miss-operating.
- Heat sealing delay: The time to heat sealing the lid on the cup is 1 second
- Vibrate time: The vibrate time is 0, which is not vibrating while filling the coffee. If the filling weight is too much, then the customer can set up this value to vibrate the cups to put more coffee inside. The value could be 0.1s/0.2s/0.3s to increase the vibration.

Interval of work station between procedures:

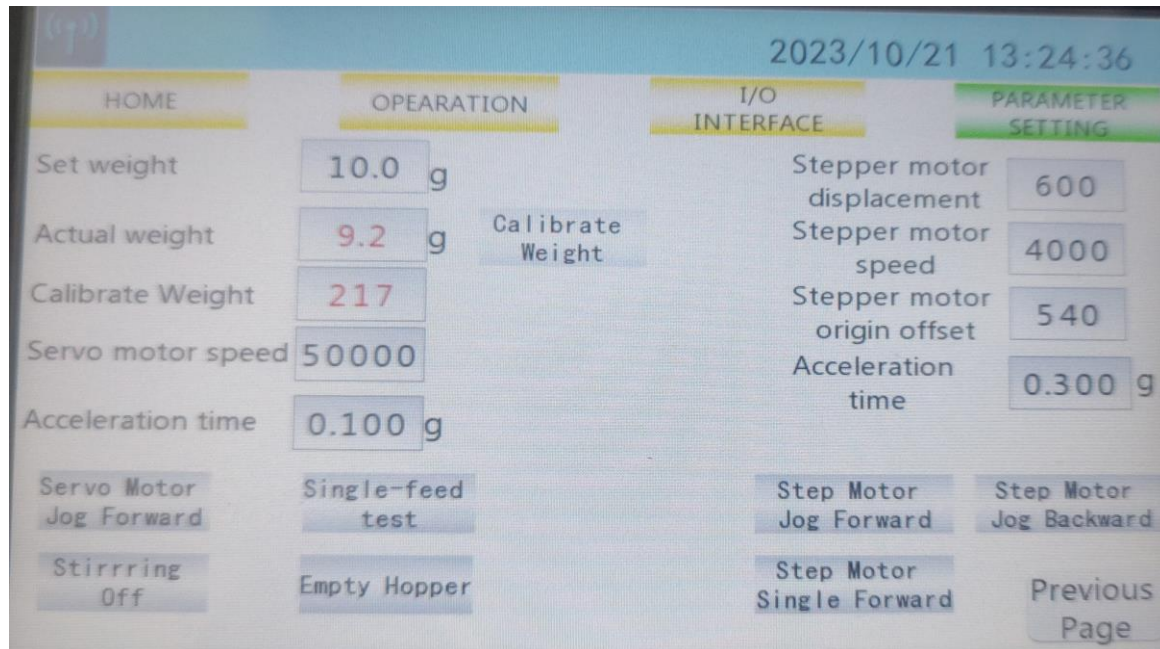
The following 5 values are used to calculate the timing of each working station inside the PLC program. They are used for machine controlling. The customer SHOULD NOT CHANGE those values unless the customer has to re-arrange the working stations.

Definition of Interval of work station:

If we name the hole (work station) on the rotary plate, it is the first hole (work station) which is the sensor to detect if there is a cup inside the hole. Then the second hole (work station) is where the hopper fills the coffee into the cup. **Therefore, we define the interval between these two holes as 1, which is shown as "Filling delay" = 1.**

- Lid detection delay: Cup detection station to lid detection station: There are 4 work stations between cup detection and the lid detection. So, the interval here is 4.
- Sealing delay: Lid detection to sealing station is 1.
- Filling delay: Cup detection to coffee filling station is 1.
- Lidding delay: The cup detection station to the station to put the lid is 3.
- Cup output delay: The cup detection station to the cup output station is 6.

Parameter setting page-2



- Set weight:** Put the target weight value here
- Actual weight:** Put the actual weight after filling here
- Calibrate weight:** Push this button to calibrate the weight, then put the actual weight again and repeat the procedure until reaches the set weight.
- Servo motor speed:** The speed of servo motor which controls the auger to fill coffee. Adjusting this speed can adjust the filling weight, but we do not recommend doing so.
- Acceleration time:** The acceleration speed of the servo motor to fill the coffee (seconds).
- Servo motor Jog forward:** Push this button to jog the servo motor step by step.
- Single feed test:** Use this button to fill a single cup of coffee while adjusting the weight.
- Stirring off:** Turn on/off the stir bars inside the hopper.
- Empty hopper:** Press this button to empty the hopper. The auger will keep running until there is no coffee inside the hopper and then click again to stop.

Stepper motor displacement: The value of the step motor moves one workstation forward

Stepper motor speed: The speed of the step motor

Stepper motor origin offset: The offset value from the origin of the step motor

Acceleration time: The acceleration speed of the step motor (seconds)

Step motor jog forward: Jog forward of the step motor step by step

Step motor jog backward: Jog backward of the step motor step by step

Step motor single forward: Click this button to turn the table one station forward

Part 2: Quick Start Manual

Step 1: Start the machine

[Click to view video: 1-start the machine](#)

1. Connect the power supply and air supply as in the following picture.



2. Turn on the power switch



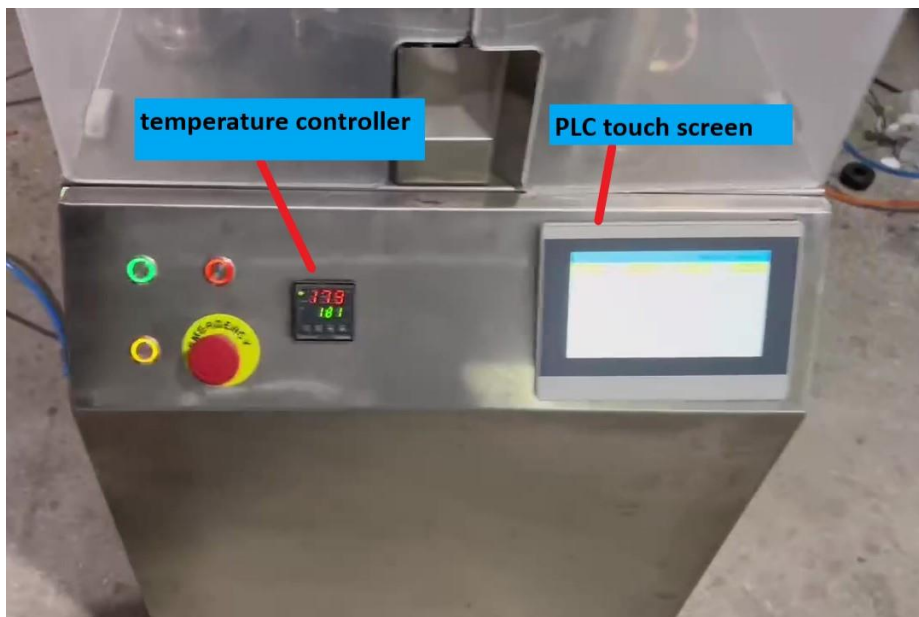
3. Check if the air supply is in normal condition

Compressed air pressure should be 0.5-0.8MPa, air consumption about 100L/min.

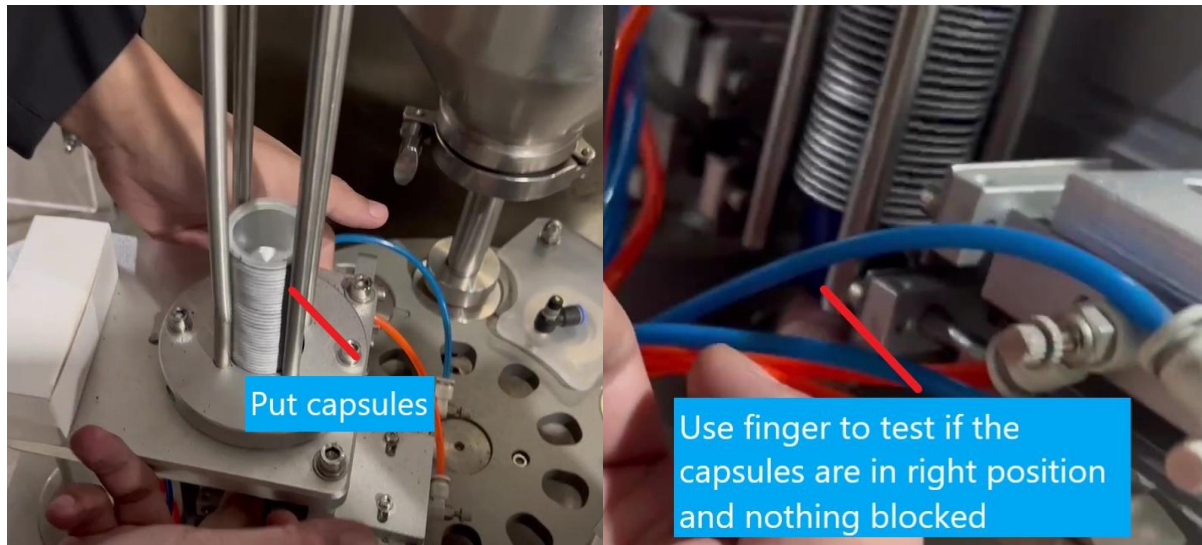


4. Check if the PLC touch screen starts and the temperature controller starts

The temperature controller will start automatically when the power is on, and heat the heater. You can set up the desired temperature (the number in green) on the controller. The actual temperature (the number in red) will increase up to the desired temperature and then stop.

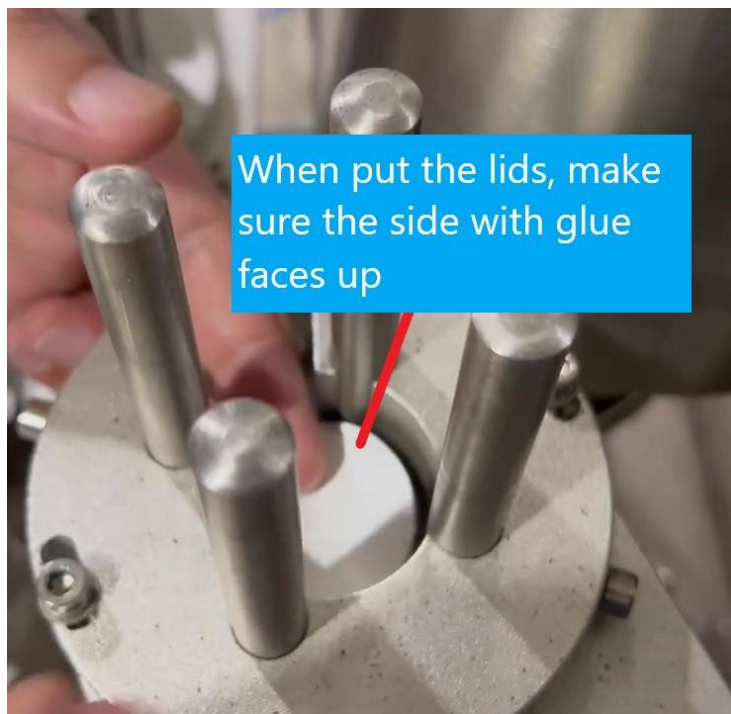


5. Put the capsules in the machine



After putting the capsules in the silo, use finger to move up the capsules a little to make sure the capsules are in good position and nothing blocked.

6. Put the lids in the machine

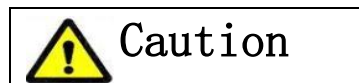


7. Put coffee in the machine



The machine is set up and ready to run.

Step 2: Fine tune each work station and debug problems



[Click to view video: 2-start machine-manual test](#)

When the machine arrives, we suggest the customer should fine tune each work station before running the machine in Auto Mode, because it is possible that some setup of the work station may come loose or offset during the transportation. And also, each time after machine maintenance or clearance, the customer should fine tune the machine.

Password for IO interface is: 888888

1. Test the capsule drop

1-1: There are a few steps to fine tune the capsule drop process:

In IO interface, we can control every movement of one work station manually.

Here are procedures to drop one cup:

- Click the Y14 <Capsule storage> button to **open the cup silo holder.**

- Click the Y10 <Capsule drop> button to **push the cup dropping into the turntable.**
- Click the Y14 <Capsule storage> button to **close the cup silo holder.**



Capsule storage cylinder Y14



Capsule drop cylinder Y10

Then in operation page, turn off all other functions, only turn on “capsule drop” function (in green), then long press jog, or click start, the machine will drop a cup into the turn table.

In auto mode, one <Capsule drop on/ off> button controls the above 3 steps, but in manual /debug mode, we need to do these 3 steps one by one, so that if there are any problems, we can find it easily.

1-2: Common problems and solutions

A: Problem: The capsule can't fall down

Solution: Check if there are enough capsules in the storage silo and add them in time. Check whether the air pressure is sufficient, normal 0.5-0.8Mpa air pressure.

B: Problem: There is deviation when the capsule falls into the mold

Solution: Adjust the capsule silo, the mold sleeve in the turntable station, and the capsule sucker beneath suction again, and make sure they are aligned in the center.

1-3. Test the capsule detection

Normal situation: The cup passes through the turntable and goes to the detection station. When there is a cup, the photoelectric components will light up, and also <X11> Capsule detection in the IO interface should be in green. When the machine detects the cups, in the next station it will feed the coffee automatically. If no cup is detected, the machine will not feed the coffee in the next station.

Common problems and solutions: if there is a problem to detect the cups, following the procedure here to debug the problem:

Put the cup into the cup detection station, Make sure the the photoelectric components on the machine lights up when there is a capsule and also check if <X11> Capsule detection is on (turn green) in the touch screen (IO Interface), and if there is no cup on the station, <X11> should be off, which means the detection device is working normally. If it works abnormally, adjusting the height, distance, position, angle, or sensitivity of the optoelectronic components until <X11> works normally.

If it still does not work, after changing those parameters, then change the photoelectric component.

Notes: When debug is on in the operation page, all sensors will not work under debug mode.

2. Test the screw position and filling station

2-1 First: make sure the auger is on the right position

Click to view video: 3-check the auger position

In manual mode, click the Y17 <filling cylinder> button to let the cylinder push up the cup, and then click <**Single feed test**> button in the parameter page 2 to manually fill one cup of coffee.

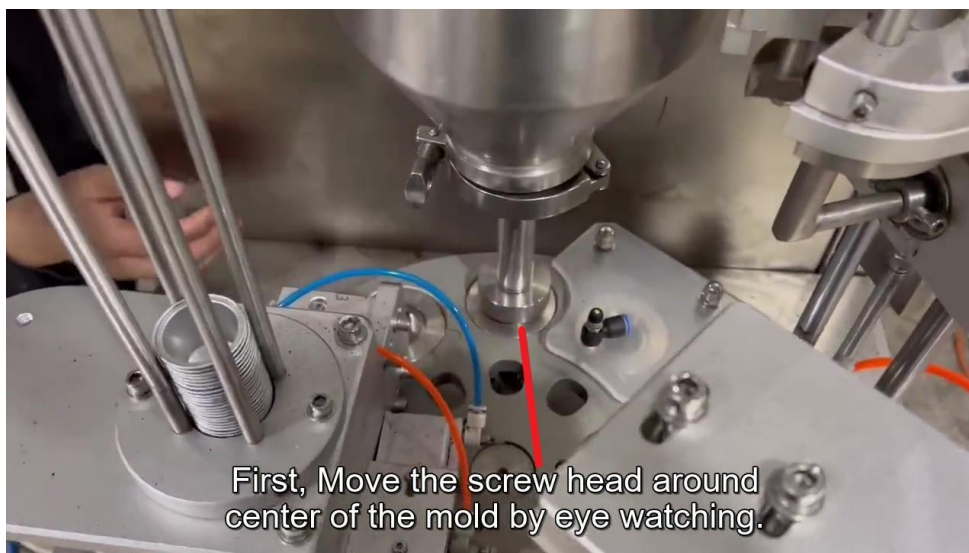


2-2 Adjusting the screw position and hopper after maintenance or transportation

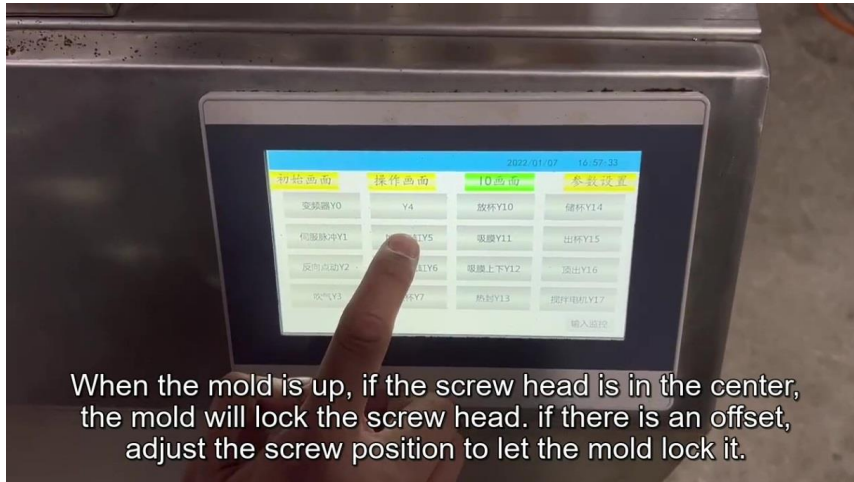
Click to view video: 4-adjust+screw+position-Y17

After transportation, or maintenance (for example, **you can move the hopper out** to empty the residue coffee in the hopper or clean the hopper, etc.), the hopper and screw head will need to be re-centered as following steps:

Step 1: move the screw head to align to the center of the mold by eye watching



Step 2: Click Y17 filling cylinder in IO interface. It will bring up the mold and if the screw is in the center of the mold, the mold will lock the screw head. If it is not, adjust the screw position until the mold locks it.



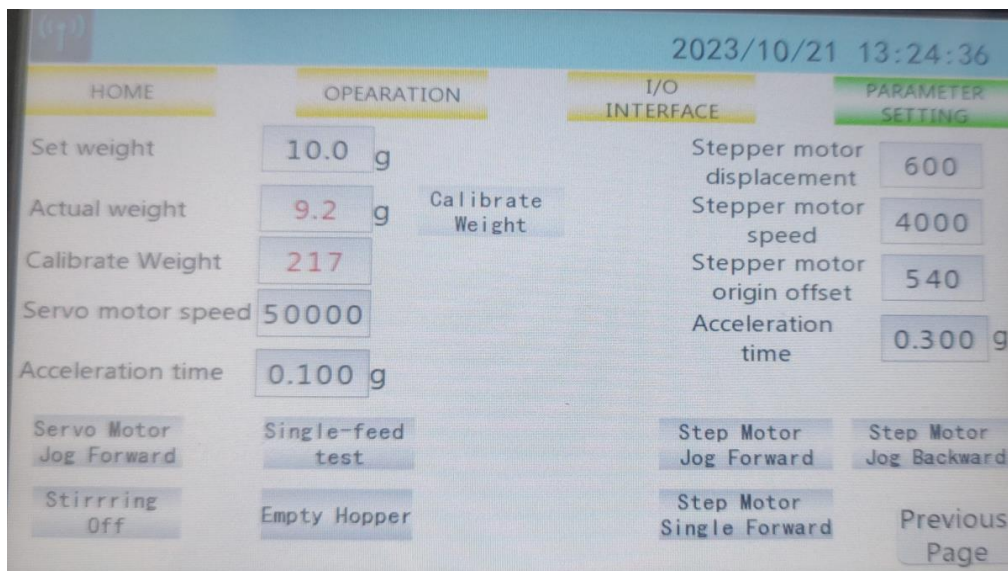
Step 3: After locking the screw, go to the back of the hopper, lock the two screws tightly to fix the hopper.



Step 4: Return to the IO interface, push Y17 filling cylinder a few times to make the screw is in the center.

Step 5: After tested the first mold, click Jog, bring the next mold and click Y17 a few times again to make sure the screw is in the centre of this mold too. Repeat this procedure until all molds are tested.

2-3 How to adjust filling weight to the target filling weight



Set weight: This is the target filling weight.

Actual weight: Use this weight with single dosing and auto calibration button to adjust actual filling weight to the target weight.

Step 1: Put the target weight in the fill weight. For example, we put 10g.

Step 2: Click Single feed test button to fill one cup of coffee.

Note 1: You can move the hopper out first to make the job easier. Just adjust the weight first, and do not touch other parts of the machine.

Note 2: Use the single feed test button to fill the 3 cups first, but do not weigh these 3 cups. Sometimes, it is not precise when the screw just starts to fill.

Step 3: Weigh the fourth cup, and write the number into the Actual weight. For example, 9.2g.

Step 4: Click calibrate weight button. Then repeat Step 2.

Step 5: Repeat step 2, weigh the fourth cup again and put that number in the Actual weight. If 20

this number is still not closer to the target weight, repeat Step 4 -- Click auto calibration button. Then repeat Step 2 until the actual weight closes to the target weight, which means **the actual weight is +0.2/-0.2g of the target weight**. In this sample, if we get the actual weight between 9.8g to 10.2g, then the filling weight is adjusted successfully.

Note 3: Sometimes, we cannot get closer to the target weight, for example, always get either 9.5g or 10.5g. In this case, we can change the value in calibrate weight directly to fine tune the final small amount of coffee to get close enough to the target weight.

Note 4: DO NOT CLICK Calibrate weight button continuously, only click ONCE after step 2. Otherwise, it could confuse the PLC program and get wrong weight.

2-4. Common problems and solutions

Q1: How to avoid the coffee overflowing the cup.

Sometimes, when the coffee density is too low, the coffee will be very loose. In this case, we can lower down the screw head to let the screw head completely cover and touch the cup to press down the coffee inside the cup.

Or, the user could increase the vibrate time in the parameter setting page 1 to shake the coffee more evenly inside the cups.

Q2: Our machine filling accuracy should be around $\pm 0.2g$, max should not be over $\pm 0.5g$. So, if we have big tolerances, there could be a couple reasons:

Reason 1: The coffee is too oily or too fine, which are very sticky. In this case, some coffee powder will be stacked on the screw, and then affect the accuracy.

Reason 2: There is too much or too less coffee inside the hopper, so that the pressure for the screw brings down the coffee either too high or too low.

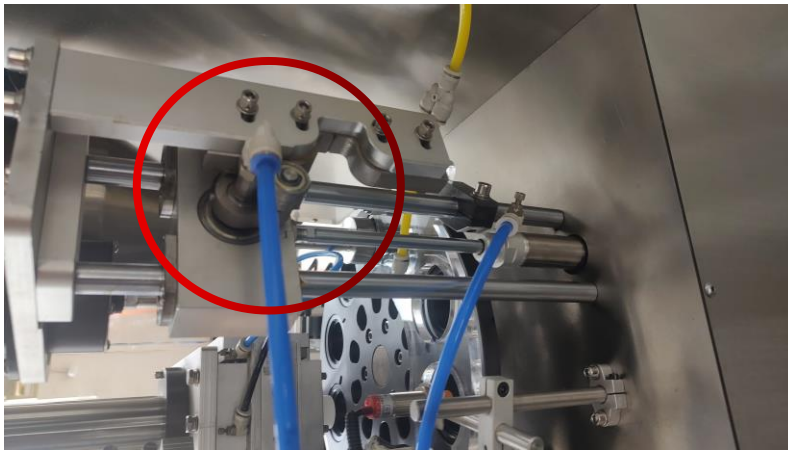
3. Place lid on the capsule

Click to view video: 5-Y11-Y12-suck+lid

There is a jackscrew on the side of the lid chamber, and the height can be adjusted by loosening the jackscrew. At the first step, you can press the Y12 lid cylinder button to stop the vacuum sucker at the highest position, and adjust the upper and lower height of the lid chamber so that the last piece of lid underneath is just close to the sucker, and the sucker is just in the center of the lid chamber. (When putting the lid, the printing side of the lid is facing down.)

After aligning, then Y11 lid suction to suck the lid, Y12 lid cylinder to bring down the lid, then

Y11 lid again to release the lid on the cup, Y12 again to bring up the sucker for the next lid.



3-1. Common problems and solutions

Q: Cannot suck the lid down

Solution:

A. Check if there is enough vacuum in the sucker.

B. Check if the suck head is perpendicular to surface of the lids.

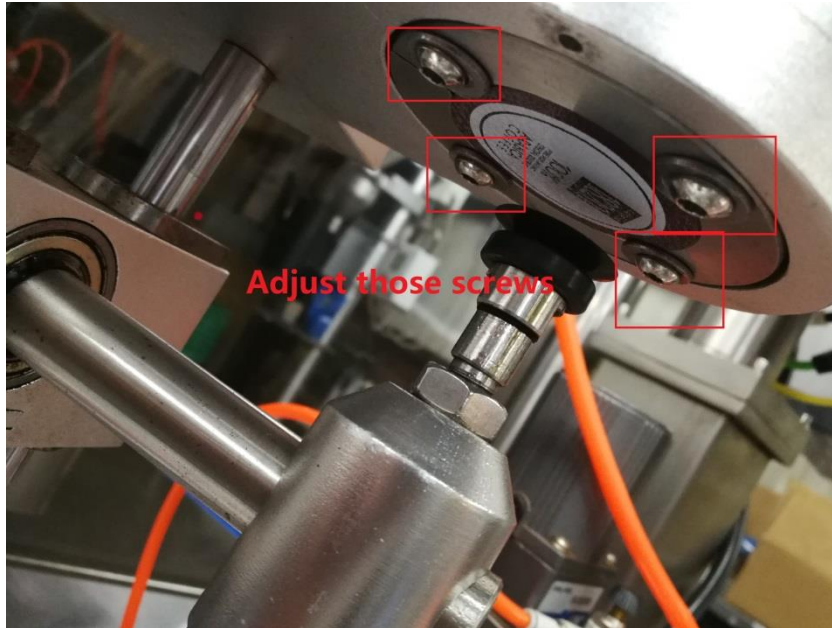
C. If there is not enough lids in the bin, put some heavy items on the top of lids.

D. Check if the lids are curved too much.

E. Check the timing of the vacuum starts and ends. Go to parameter page, then press the jog button to move the sucker one step by one step, and in the meantime, watch the encoder current position to know when the vacuum starts and ends, then adjust the encoder start time (200) and end time (650) of the suck lid servo motor in parameter page to

get the best timing of the vacuum.

F: Adjust the support screws of the lids as shown in the following picture. Those holders cannot be too loose or too tight.



4. Lid detection station

[Click to view video: 6-sensor-detect+lid](#)

As shown in the video, check if the sensor turns on and X12 lid detection is on when there is a lid on the capsule.



5. Heating sealing station

[Click to view video: 7-Y13-sealing](#)

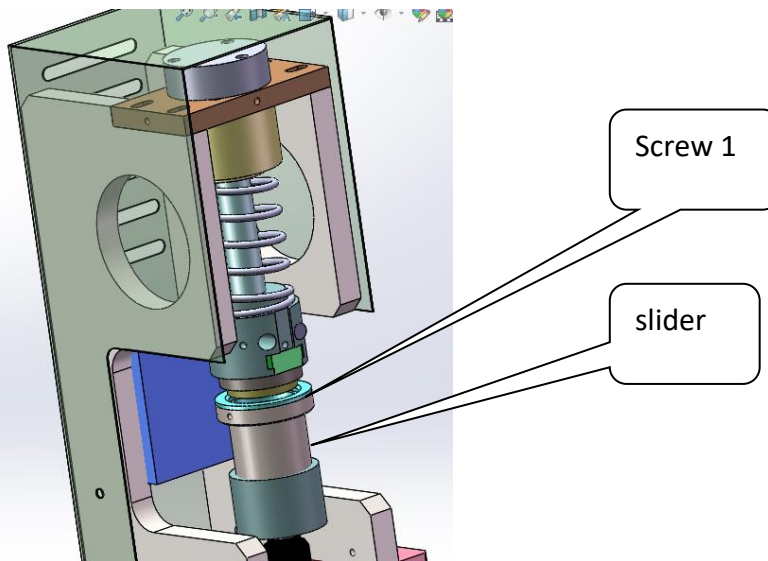
Click the Y13 <Heat Sealing> button, the heat sealing cylinder will be pushed down, pressed copper head on the surface of the cup, and seal it. Push Y13 again to return the cylinder when the sealing is done.

5.1 Pressure adjustment

The pressure regulator of the conjunction cylinder can adjust the sealing pressure on the lid. According to different cup and lid materials, it should be adjusted to the best sealing effect.

5.2 Replacement of heating tube

As shown in following picture, there is a jackscrew next to the heating tube, and the heating tube can be taken out by loosening the jackscrew. The operation is simple, convenient and quick. If you need to change the copper head, you can also directly loosen the screw 1 and take out the slider, then take out the copper head.



5.3: Common problems and solutions

Problem 1: The sealing is not strong enough, how to solve this problem?

Solutions:

- A: The heating temperature is too low; increase the temperature.
- B: The clamping pressure is too low; increase it appropriately.
- C: Adjust the cylinder parameters to lengthen the cylinder sealing time.

Problem 2: The edges of the seal are not balanced, some are firmed and some are loosen, how to solve this problem?

Solution:

A: Adjust the heating device so that it is perpendicular to the center of the mold hole.

B: Loosen the upper thread, and then properly rotate the universal block on the heating copper head.

C: Check if the copper head is dirty, or check if the capsule edge has too much dirt.

Problem 3: The sealed lid does not coincide with the outer diameter of the cup, and there is a deviation. How to solve this problem?

Solution:

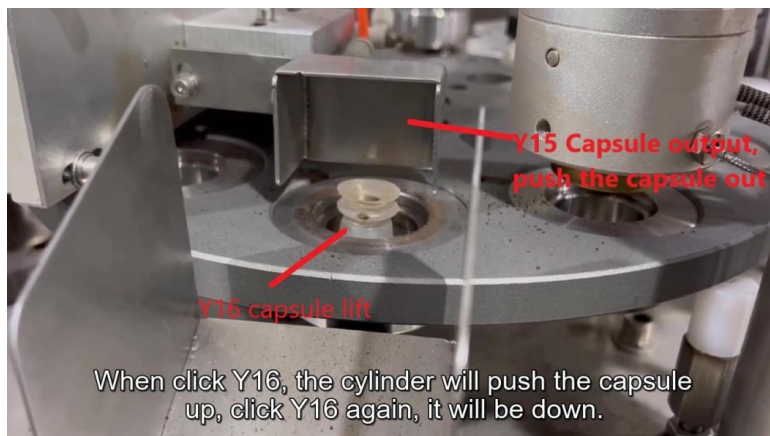
A: Adjust the lid chamber so that it is accurately sucked onto the surface of the cup.

B: Check whether the outer diameter of the lid and the cup match, and whether the diameter size is the same.

6. Discharge Capsules

Click to view video: 8-Y15-Y16-cup+exit

In IO interface manual mode, first click the Y16 <Capsule Lift> button to push up the capsules, and then click Y15 <Capsule Output> button to discharge the capsules; click Y16 again to return the sucker, and Y15 again returns the pusher.



7. Restoration of the machine start point

Click to view video: 9-adjust origin position

Now, all procedures are tested, but before running the machine, we also need to restore the machine to the initial start point by **clicking the button “Reset All”** on the operation page.

After clicking the restoration, the turntable will turn back to the initial position automatically. But sometimes, it will not arrive at the exact point, there could be a little offset. Watch the screw head position to see if it is aligned with the mold to determine if there is an offset.

If there is an offset, push Jog button once to let the turntable adjust itself a little bit, then long press Jog button again to move forward one more station of the turntable to make sure the machine is at initial start point.

8. First run - Machine is ready

Click to view video: 10-start-first+run

Now we are ready for the first time running of the machine, as the following steps:

- Turn on 6 operation buttons in operation interface.
- Double check that the temperature controller reaches the pre-setting temperature.
- Click Run button on the machine or on the PLC operation interface.
- After 2-3 capsules dropped, turn off the capsule drop, and let the machine finish these 2-3 capsules completely.

If these 2-3 capsules are no problem at all, turn on the Capsule drop button again, and let the machine pack the capsules automatically.

