

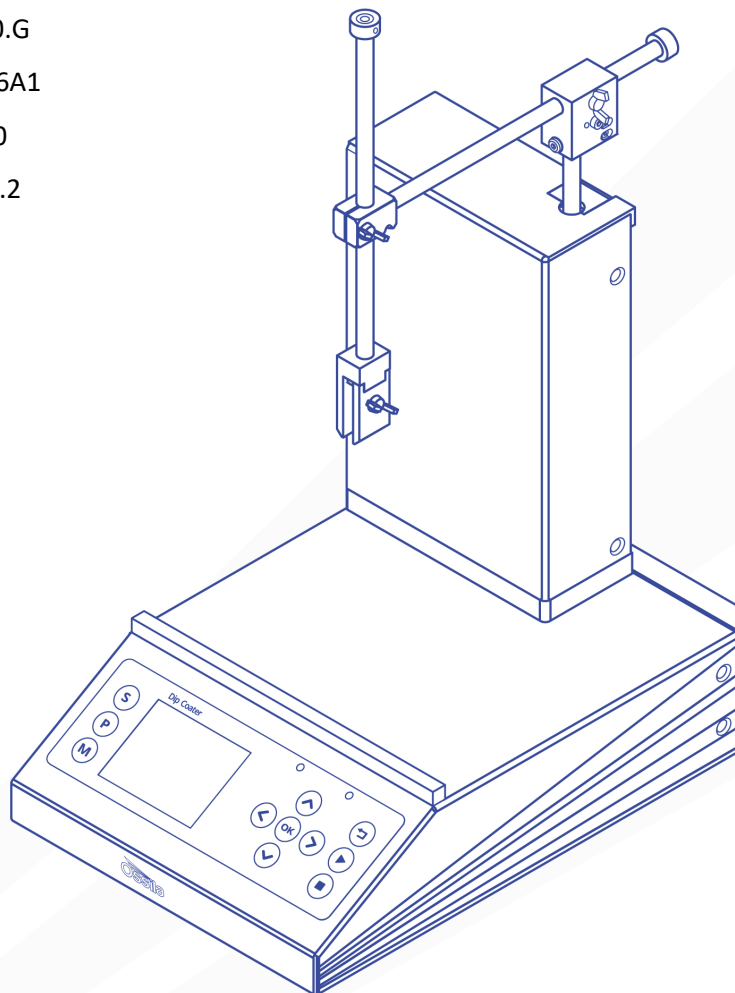
# DIP COATER USER MANUAL

Manual Version: 1.0.G

Product code: L2006A1

Product Version: 1.0

Software Version: 1.2



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# 1. Overview

The Ossila Dip Coater is a simple-to-use system designed to deposit thin wet films of solution. Dip coating involves the controlled immersion and withdrawal of a substrate from a reservoir of solution, it is widely used in research and development as well as large-scale production.

Film thickness is determined by a balance between several competing forces on the fluid's surface: viscous force, capillary forces, and draining forces. Ultimately, film thickness is determined by a combination of the solution properties and the rate of substrate withdrawal from the solution.

The Ossila Dip Coater can finely control properties such as the immersion speed, dwell, time, withdrawal speed, and drying time. This gives you accurate control over the final thickness and properties of the deposited film. Equipped with high-precision motors, the system offers excellent accuracy and reproducibility for travel speeds and substrate positioning. In addition, the system provides a wide range of coating speeds (ranging from 0.01mm s<sup>-1</sup> to 50mm.s<sup>-1</sup>), variable withdrawal rates for graded films, and the option to perform repeat cycles. Additional software features include user profiles, saveable programmes, crash-sensing software, and changeable working units.

The Ossila Dip Coater's wide working base means that larger beakers (up to 2 litres in size) can be used. As the movement distance of the arm is 110mm, you can coat substrates over 100mm in length. Its clamping mechanism uses a simple spring-loaded clamp for easy substrate removal. Clamp pressure can be adjusted to suit either delicate or heavy substrates. To ensure user safety, the Ossila Dip Coater comes with an inbuilt crash-sensing switch. This will stop the motor if the arm hits an object, protecting your substrates and glassware.



## 2. EU Declaration of Conformity (DoC)

**We**

**Company Name:** Ossila BV

**Postal Address:** Biopartner 3 building, Galileiweg 8

**Postcode:** 2333 BD Leiden

**Country:** The Netherlands

**Telephone number:** +31 (0)71 3322992

**Email Address:** [info@ossila.com](mailto:info@ossila.com)

**declare that the DoC is issued under our sole responsibility and belongs to the following product:**

**Product:** Dip Coater (L2006A1)

**Serial number:** L2006A1-xxxx

**Object of declaration:**

Dip Coater (L2006A1)

**The object of declaration described above is in conformity with the relevant Union harmonisation legislation:**

Machinery Directive 2006/42/EC

EMC Directive 2014/30/EU

RoHS Directive 2011/65/EU

**The following harmonised standards and technical specifications have been applied:**

BS EN ISO 12100:2010 Safety of machinery - General principles for design - Risk assessment and risk reduction.

**Signed:**



**Name:** Dr James Kingsley

**Place:** Leiden

**Date:** 16/11/2021

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# 3. Safety

## 3.1 Warning

- Only use the 24V power adapter and power cord supplied with the unit.
- If using flammable or hazardous solvents, users are expected to be trained in their usage and carry out a COSHH risk assessment.
- Keep the area around the machine clear, approximately a 150 cm clearance above and 150 cm to the sides and behind.
- Keep clear of the machine while it is in operation.
- If using hazardous solvents always use within a fume hood or controlled environment.
- There are pinch points when in operation, keep hands clear of moving parts.
- Do not use in an explosive atmosphere

## 3.2 Use of Equipment

This Dip Coater is designed to be used as instructed and under the following conditions:




- Indoors in a laboratory environment (pollution degree 2)
- Altitudes up to 2000 m
- Temperatures of 5°C to 40°C; maximum relative humidity of 80% up to 31°C.

The Dip Coater is supplied with a 24VDC power adapter with a power cord for the country of purchase, (in accordance with European Commission regulations and British Standards). The use of any other electrical power cables, adaptors, or transformers is not recommended.

## 3.3 Hazard Icons

Please note the following symbols that can be found at points throughout the rest of the manual.

Table 3.1 Hazard warning labels used in this manual.

Symbol	Associated Hazard
	General warning or caution, which accompanying text will explain
	Electrical shock
	Pinch point

## 3.4 General Hazards

Before installing or operating the Dip Coater, there are several health and safety precautions which must be followed and executed to ensure safe installation and operation.

**WARNING:** Improper handling when operating or servicing this equipment can result in serious injury. Read this manual before operating or servicing this equipment.



- I. **CAUTION:** During operation, the movement of the clamping arm could result in a pinch point hazard. Caution should be taken whenever the system is in operation.



- I. **Emergency power disconnect options:** Use the power cord as a disconnecting method and remove it from the power source. To facilitate disconnect, make sure the power outlet for this cord is readily accessible to the operator.

## 3.6 Servicing

- Modification or service has taken place by anyone other than an Ossila engineer.
- The Unit has been subjected to chemical damage through improper use.
- The Unit has been rendered inoperable through accident, misuse, contamination, improper maintenance, modification, or other external causes.



## 3.7 Health and Safety – Installation



- I. Pinch points are present during operation of the Dip Coater. As a precaution, users should avoid handling or leaning over the equipment during operation in order to avoid possible crushing or entanglement of hair and/or clothing.

## 3.8 Health and Safety – Servicing

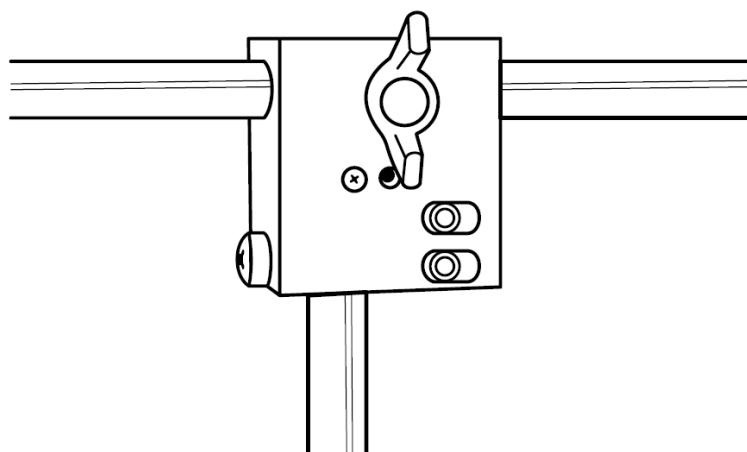


- I. Servicing should only be performed by an Ossila engineer. Any modification or alteration may damage the equipment, cause injury, or death. It will also void your equipment's warranty.

## 3.9 Crash-Detection Switch

The Dip Coater is fitted with an inbuilt crash-detection switch. The crash-detection switch is housed within the connection between the mounting arm and stage (see Figure 3.1). During normal operation, the safety switch will remain in a constant 'ON' state, with the bar attached to the motor pressing against the switch. When the arm encounters an object (e.g. a hand, beaker, or the base of the equipment), it will cause the arm and the housing of the switch to rotate relative to the bar attached to the motor. This releases the switch, setting it to an 'OFF' state and cutting power to the motor.

Figure 3.1. The housing for the emergency switch



## 4. Unpacking

### 4.1 Packing List

The standard items included with the Dip Coater are:

- The Dip Coater unit
- Dipping arm and clamp
- Power adapter with a power cord (specific for country of operation)

### 4.2 Damage Inspection

Examine the components for any evidence of shipping damage. If damage has occurred, please contact Ossila directly for further action. The shipping box comes with a shock indicator to show if there has been mishandling of the package during transportation.

## 5. Specifications

The Dip Coater specifications are shown in Table 5.1. and Table 5.2.

Table 5.1. Dip Coater specifications

Dip Coater Feature	Specifications
Travel Length	100 mm
Minimum Speed	0.01 mm.s <sup>-1</sup> ; 0.6mm.min <sup>-1</sup>
Maximum Speed	50 mm s <sup>-1</sup> ; 3000 mm.min <sup>-1</sup>
Positional Reproducibility	0.01%
Rate Reproducibility	0.1%
Maximum Substrate Length	100 mm
Maximum Number of Cycles	1000 cycles
Maximum Timer Duration	99:59:59 (HH:MM:SS)
Power Supply	Input: 100-230V; 50/60Hz; 50VA Output: 24 VDC / 2A power adapter (supplied with the unit)
Dimensions (Depth x Width x Height)	300 mm x 200 mm x 350 mm (450 mm at full extension)
Operating Temperature/Humidity	5°C to 40°C; Up to 80% RH at 31°C
Weight	<5 kg

Table 5.2. Dip Coater software specifications

Dip Coater software	Specifications
Units	mm.s <sup>-1</sup> , mm.min <sup>-1</sup>
Users	Total of 10 user profiles to select from
Settings Mode	Set solution height; substrate length; substrate position; units
Manual Mode	Set immersion speed; withdrawal speed; control motion using keypad
Programmes	Each user has 10 individual programmes that can be saved
Programme Mode	Set immersion rate; dwell time; initial withdrawal rate; final withdrawal rate; dry time; number of cycles

## 6. System Components

The Dip Coater comes with the following components:

- Dip Coater unit (Figure 6.1)
- Power supply cord and power supply (Figure 6.2)
- Dipping arm and clamp

Figure 6.1 The Ossila Dip Coater

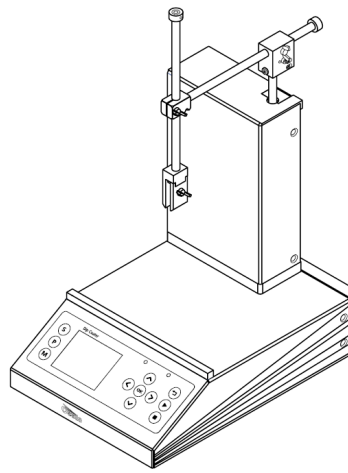
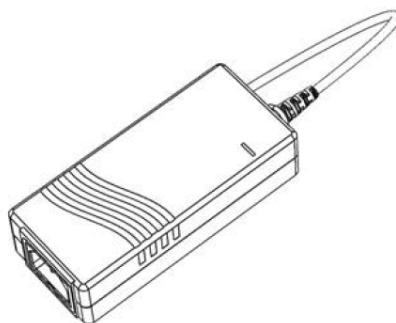


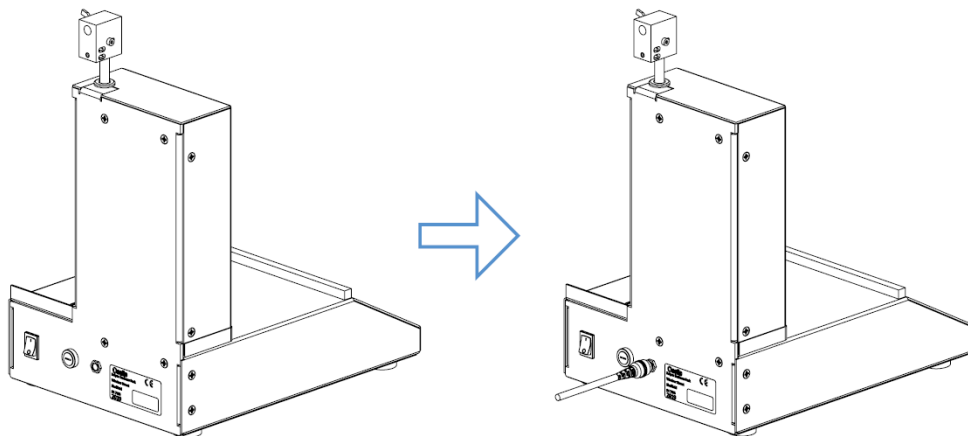
Figure 6.2 Main power cord and power supply. The Dip Coater is shipped with a plug suited for the country of purchase



## 7. Installation

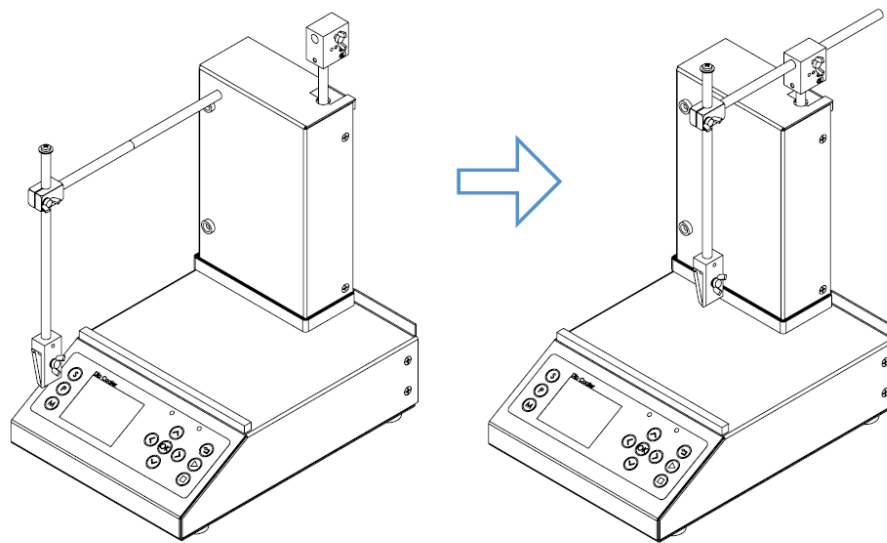
1. Place the unit on a solid, level surface.
  - i. Ensure the area is free from vibrations, temperature extremes, and highly flammable or explosive materials. Keep the area surrounding the machine clear, with approximately 150 mm clearance above the machine, to the sides of the machine, and behind the machine.
2. Before plugging in the Dip Coater, ensure the power switch on the unit is switched to the '0' position (off).
3. Connect the power supply connector to the Dip Coater.
  - i. See Figure 7.1 for connecting the power supply cable to the Dip Coater
4. Switch the Dip Coater power switch to the '1' position to turn on.

Figure 7.1 Installation of the Dip Coater by plugging in the power supply cable



5. To install the dipping arm loosen the wingnut on the side of the black metal block that houses the crash detection switch.
6. Slide the dipping arm into the hole in the black metal block (See Figure 7.2). The dipping position of the arm can be adjusted by varying how far this is inserted.
7. When the dipping arm is in the desired position (ideally in the middle of the platform) tighten the wingnut screw until the arm no longer slides.

Figure 7.2. Installation of the Dip Coater by plugging in the power supply cable.

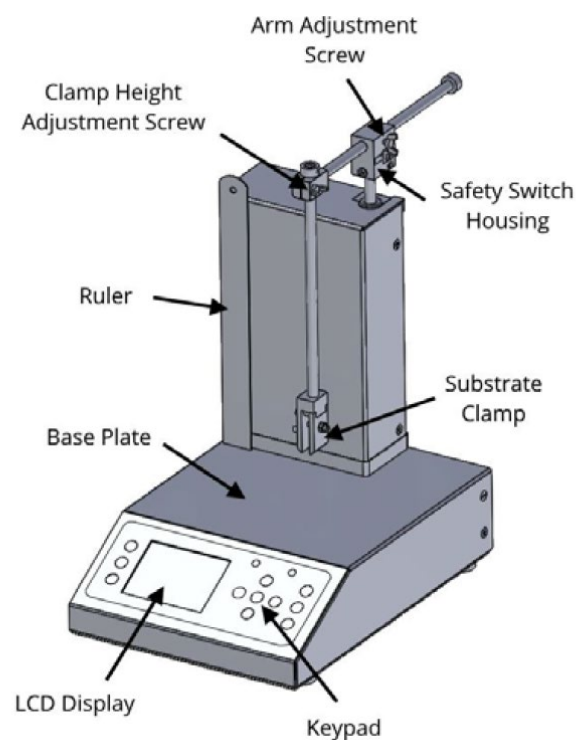


## 8. Operation

### 8.1 Dip Coater Diagram

An isometric view of the glove box is shown in Figure 8.1, with all the relevant components highlighted.

Figure 8.1. Dip Coater schematic.



## 8.2 Dip Coater User Interface

Figure 8.2 shows the front panel of the Dip Coater, where the function of each of the keypad buttons is explained in Table 8.1.

Figure 8.2. Dip Coater LCD screen and keypad.

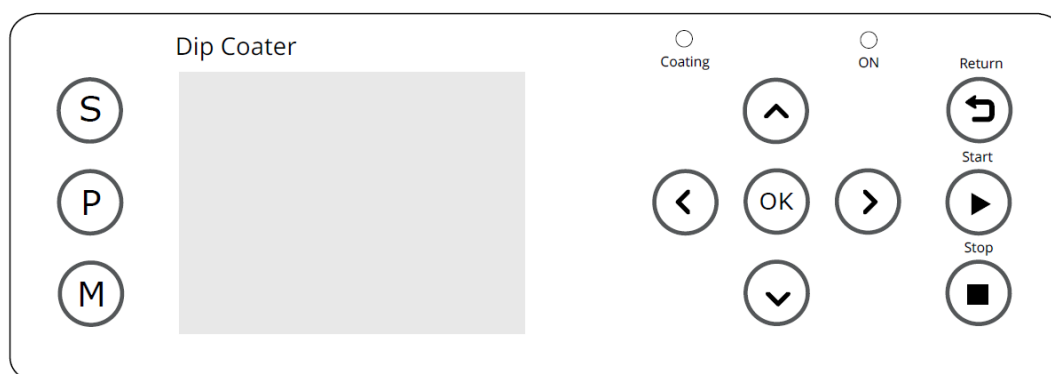


Table 8.1. Operational buttons and their associated functions.

Button	Function
S (SETTINGS)	Opens the Settings menu where the solution height, substrate length, and substrate position can be set. The units can also be altered here.
M (MANUAL)	Enters the Manual mode where the immersion speed and withdrawal speed can be set. The arm can be immersed and withdrawn manually.
P (PROGRAM)	Enters the Programming mode where saved programs can be selected and/ or edited.
	Navigates 'up' through the menu; increases selected values by 1; cycles through options; moves the arm upwards (manual mode only).
	Navigates 'down' through menus; decreasing selected values by 1; cycling through options; moving the arm downwards (manual mode only).
	Navigates 'right' through menus
	Navigates 'left' through menus
	Press to select, edit, or accept changes
	Stop the currently running program.
	Start the program.

## 8.3 Practical Operation



When using volatile solvents or hazardous solvents/materials, the instrument should be placed within a fume hood or glovebox. When using the Dip Coater, a general start-up procedure should be followed before beginning to coat.

### 8.3.1 Positioning the Dipping Arm

1. Turn the unit on, press the 'M' button to enter the manual mode. Adjust the arm to its lowest position.
2. Using the clamp height adjustment screw, raise the clamping arm so that it is around 10 mm higher than the maximum length of the substrate you are coating.
3. Press return to raise the arm to the top.

### 8.3.2 Positioning the Reservoir and Dipping Arm

1. Place the solution reservoir on the base plate of the unit.
2. Centre the reservoir under the dipping arm.
3. The position of the dipping arm can be adjusted to be nearer or further away from the user by loosening the arm adjustment screw.
4. Ensure that there is a distance of at least 1 cm from the edge of the baseplate of the Dip Coater.

### 8.3.3 Adjusting Clamp Strength

1. Pull back one half of the clamp and insert a substrate, being sure to provide support in case the clamp strength is not yet high enough.
2. Let go of the substrate to check if the clamp can currently support its weight.
3. If the substrate begins to slip, tighten the clamp adjustment screw to increase the pressure from the spring.
4. The screw should be tightened until the substrate is held securely in place.
5. If a delicate substrate is being used, you can reduce the clamp pressure by loosening the adjustment screw.

### 8.3.4 Setting the Solution Height, Substrate Position, and Coating Length

In the 'settings' mode, you can:

1. Update the length that you wish to coat over.
2. The height of the solution relative to the ruler provided.
3. The position of the bottom of the mounted substrate relative to the ruler provided.



## 8.4 Program Operation

### 8.4.1 Dip Coater Start Up

1. Switch ON (position '1') the Ossila Dip Coater power switch. The screen below will be shown.



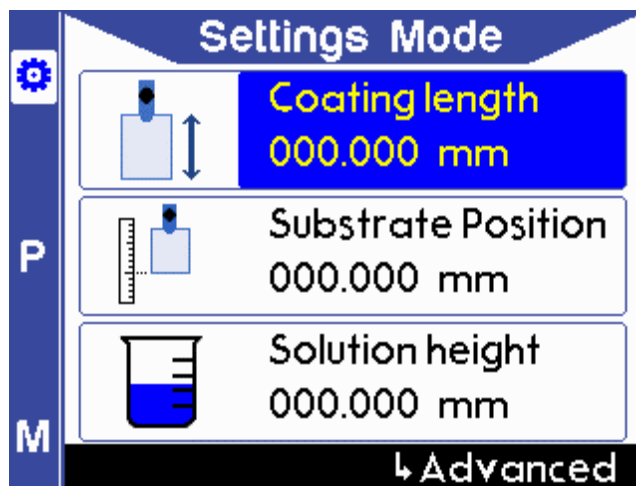
2. After the Ossila logo page, reset the arm to the 'Home' position by pressing the OK button.



3. While the arm is moving to the 'Home' position, the message below will be shown on the screen.

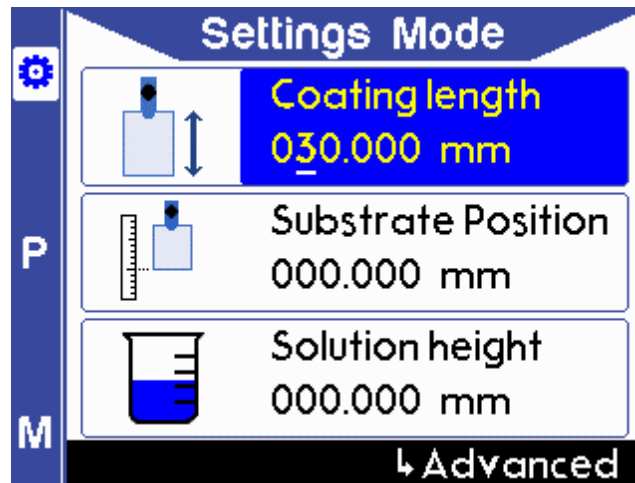


4. Once the system is at the 'Home' position, the 'Settings Mode' page will be prompted.

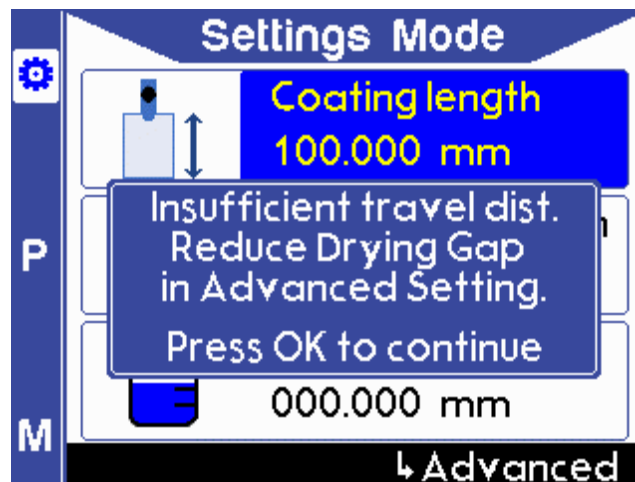


#### 8.4.2 Settings Mode

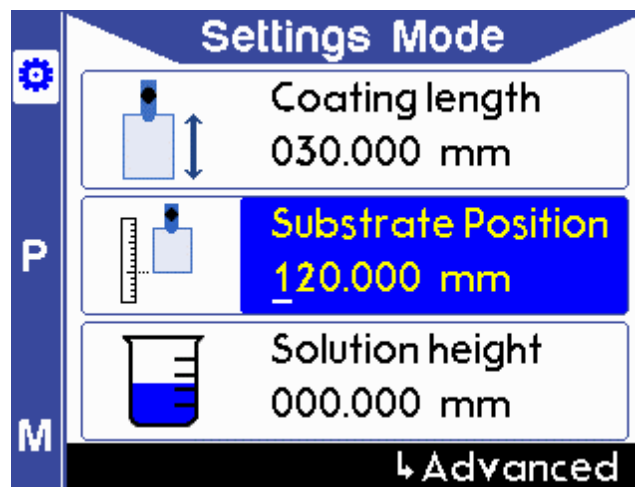
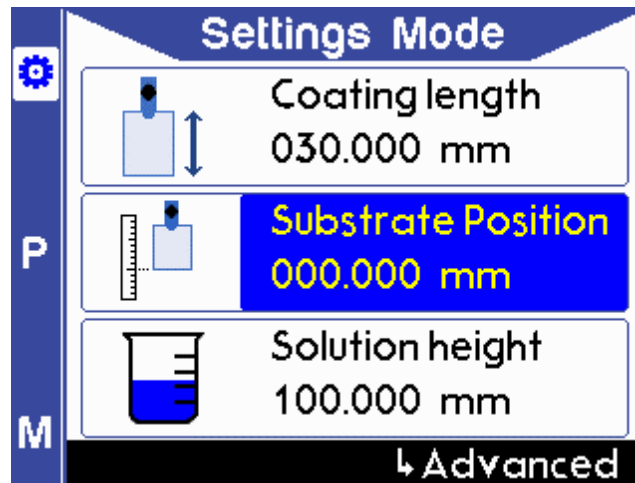
1. To enter 'Settings' mode, press the S button (located at the top left-hand side of the screen).
2. To edit the coating length value, press the OK button, then navigate between the digits by pressing either the left or right button. To increase or decrease the value of the selected digit, press the up or down button. Press OK again to exit the edit mode.



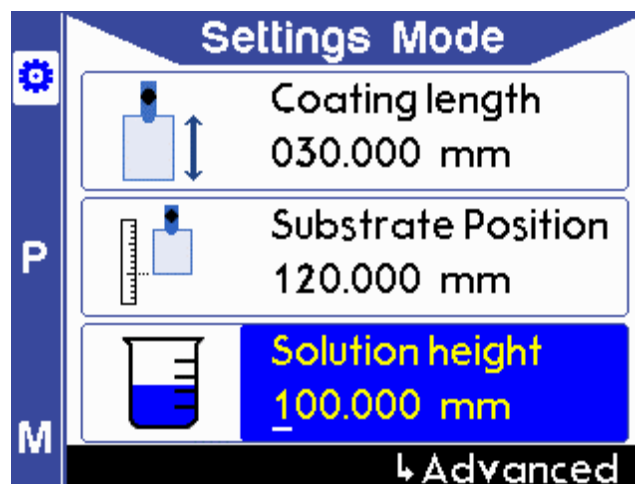
Note: The maximum travel distance of the system is 100 mm. Any coating length and drying gap values (refer to Step 7) should be within maximum travel distance. The coating length will be auto corrected if the added value is more than 100mm, and you will be alerted by a warning message.



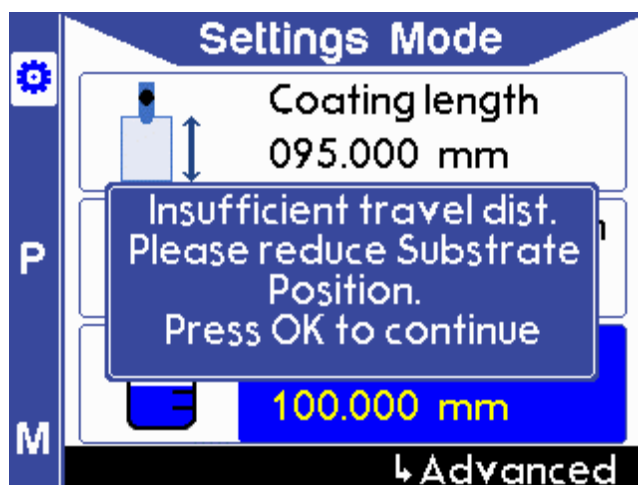
- To navigate to 'Substrate Position', press the down button and then OK to edit the value. Press the left or right button to navigate between the digits and press the up or down button to increase or decrease the selected digit. Press OK again to exit the edit mode.



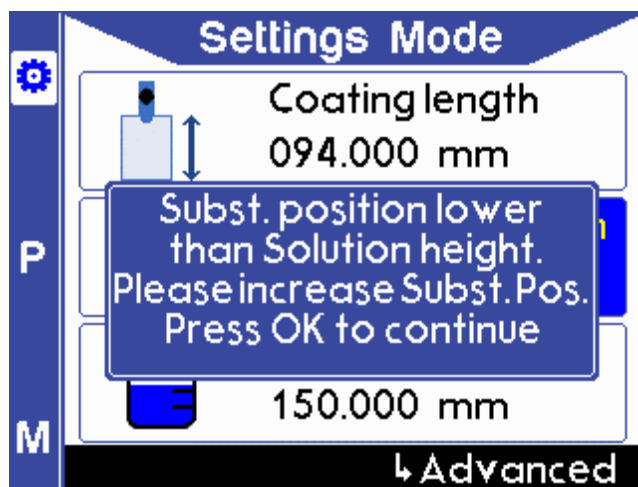
4. To navigate to 'Solution Height', press the down button and then OK to edit the value. Press the left or right button to navigate between the digits and press the up or down button to increase or decrease the selected digit. Press OK again to exit the edit mode.



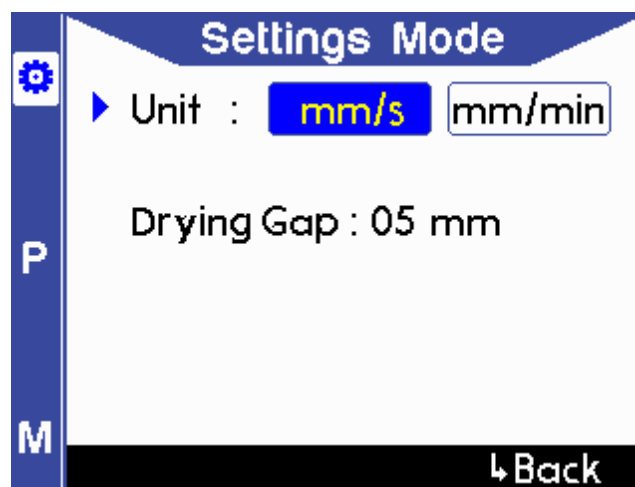
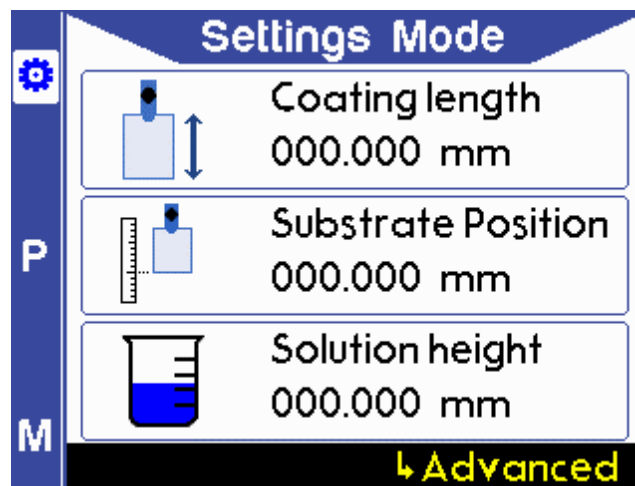
Note: A warning message will appear if the difference between substrate position and solution height plus coating length and drying gap is more than the maximum travel distance (100 mm).



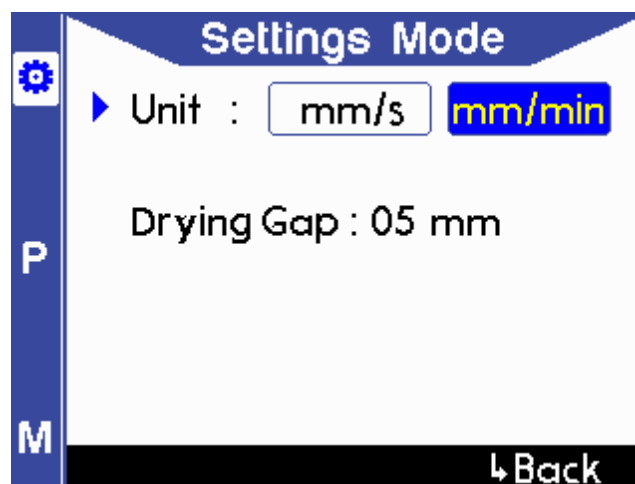
Note: A warning will appear if the substrate position is set below the solution height.



5. To navigate to 'Advanced Settings', press the down button until 'Advanced' is highlighted in yellow, then press OK.

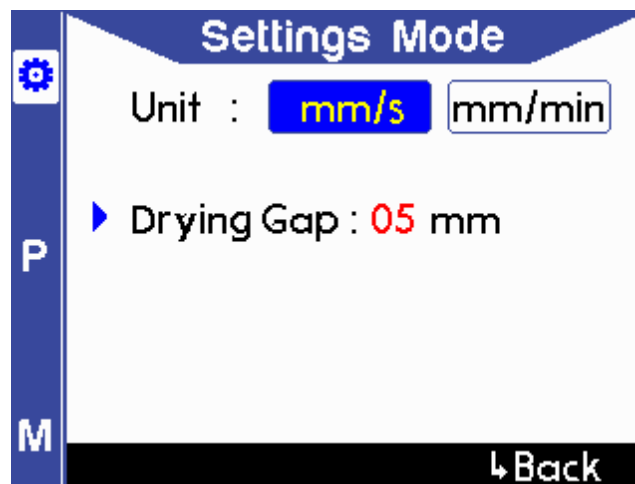


- To change the unit from mm/s to mm/min, press OK to edit and press the left or right button to select the unit.

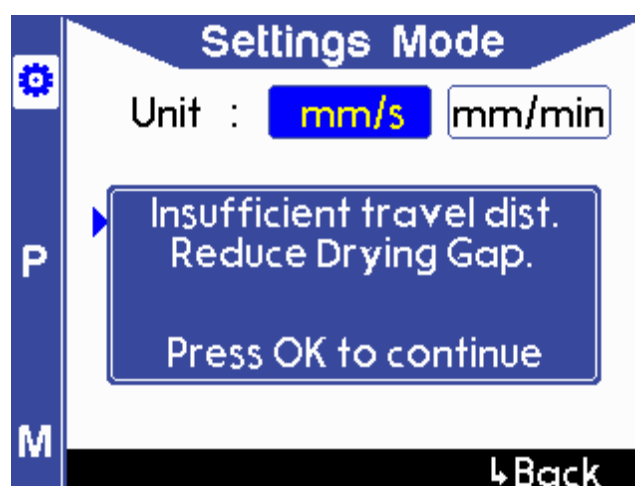


7. To change the 'Drying Gap' value, navigate by pressing the down button, and press the OK button to edit the value. Press the up or down button to increase or decrease the value. Press OK again to exit the edit mode. The maximum drying gap is 50 mm, and the default value is 5 mm.

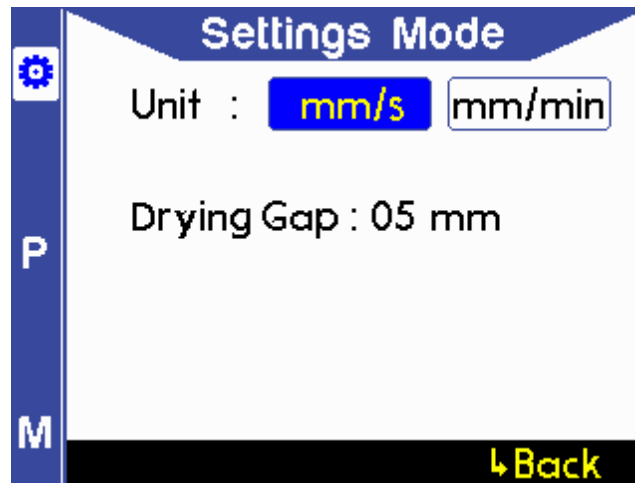
Note: The default 'Drying Gap' is 5 mm. The value will reset every time the Dip Coater is switched OFF.



Note: The maximum travel distance of the system is 100 mm. Any increases in coating length value (in (Step 2.) and Drying Gap should be within this maximum travel distance. The coating length will be autocorrected if the added value is more than 100 mm.

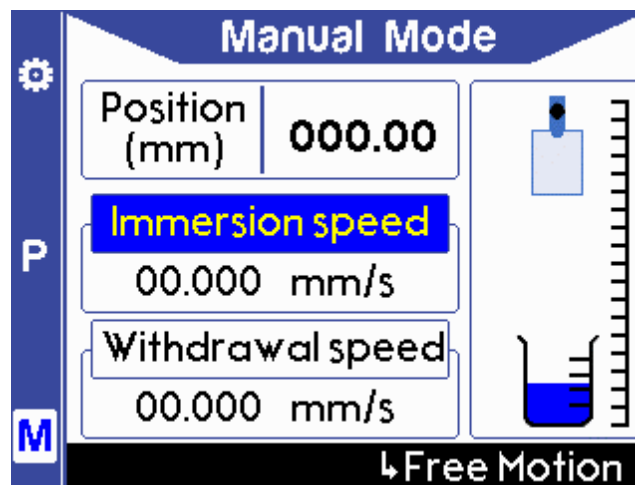


8. To navigate to a previous page, press the down button until 'Back' is highlighted in yellow to select it, and then press OK.



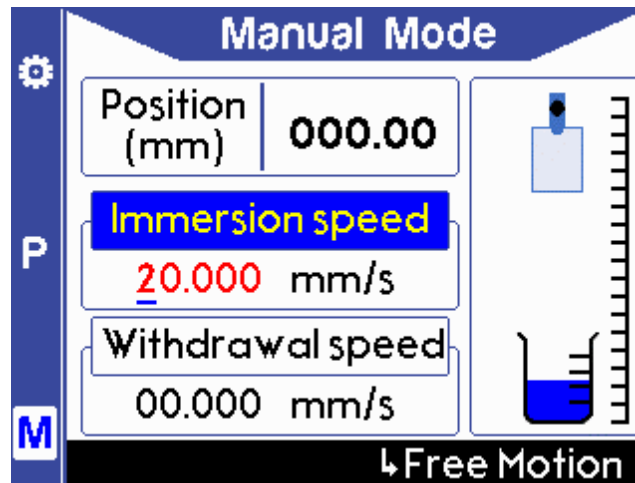
### 8.4.3 Manual Mode

1. To enter 'Manual Mode', press the M button on the left-hand side of the screen.

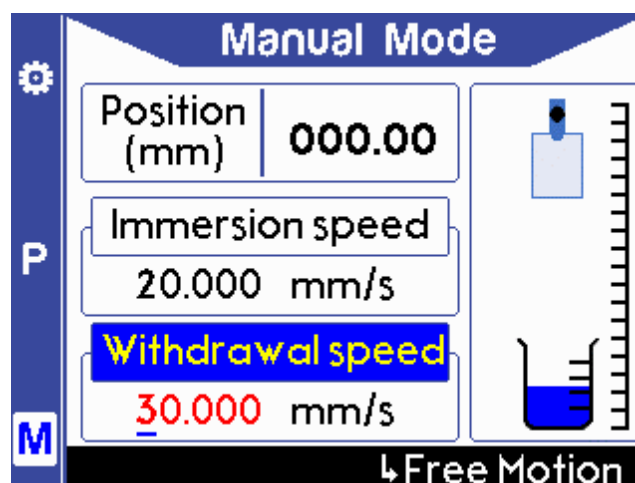
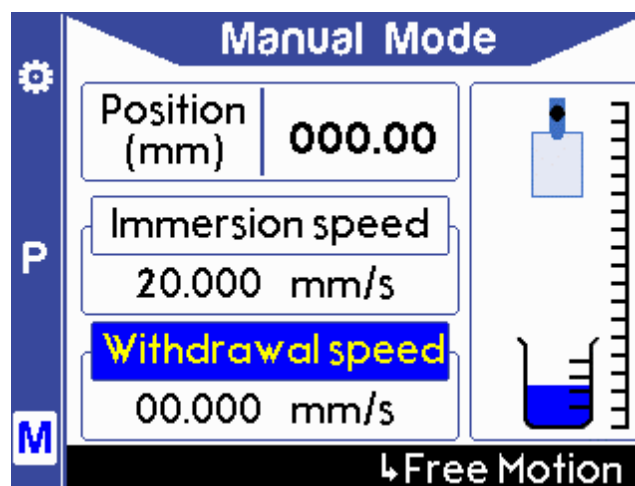


2. To set the immersion speed, navigate to 'Immersion speed' and press OK to edit the value. To change the value, press the left or right button to navigate between the digits, and press the up or down button to increase or decrease the selected digit. Press OK again to exit the edit mode.



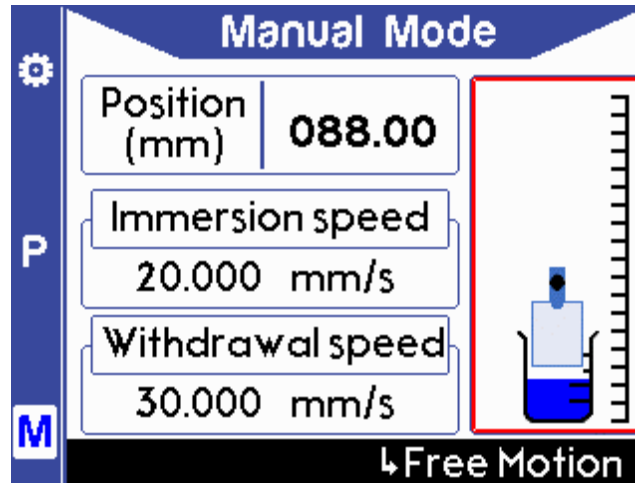


3. To set the immersion speed, navigate to 'Immersion speed' and press OK to edit the value. To change the value, press the left or right button to navigate between the digits, and press the up or down button to increase or decrease the selected digit. Press OK again to exit the edit mode.

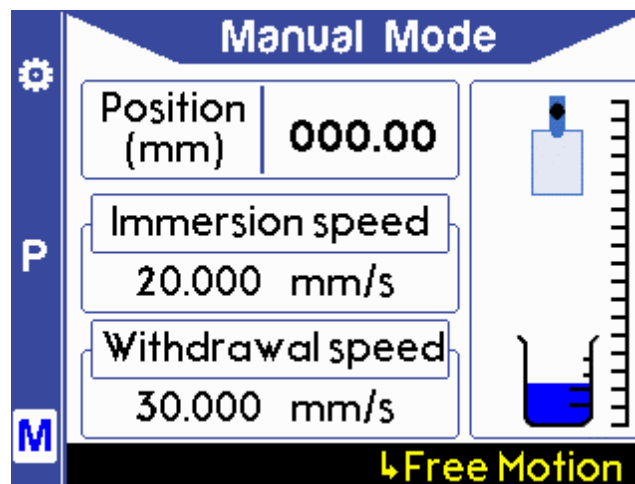


4. To operate the clamping arm, press the left button to select the diagram on the screen. Then, press the up or down button to move the arm based on the set speed.

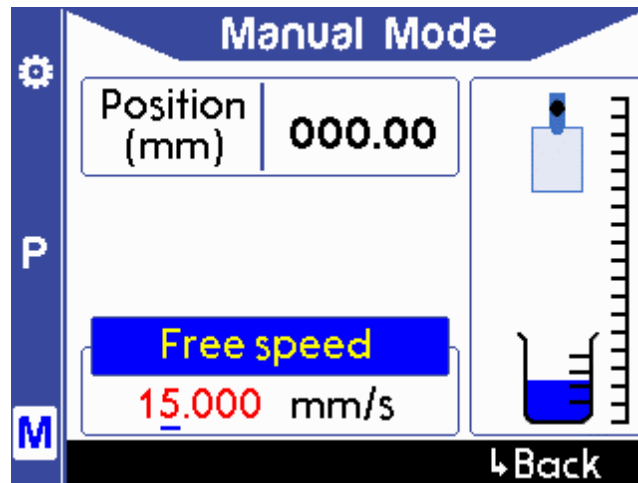
Note: The maximum travel distance is 100 mm.



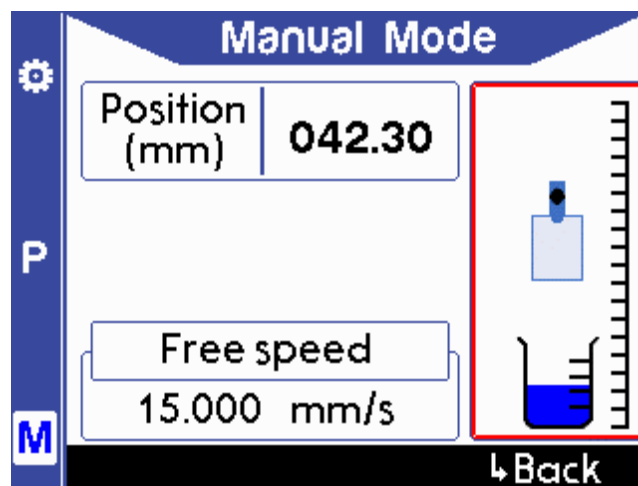
5. Alternatively, you can move the clamping arm with a single speed for up-and-down motion. Navigate to 'Free Motion' until it is highlighted in yellow, then press OK.



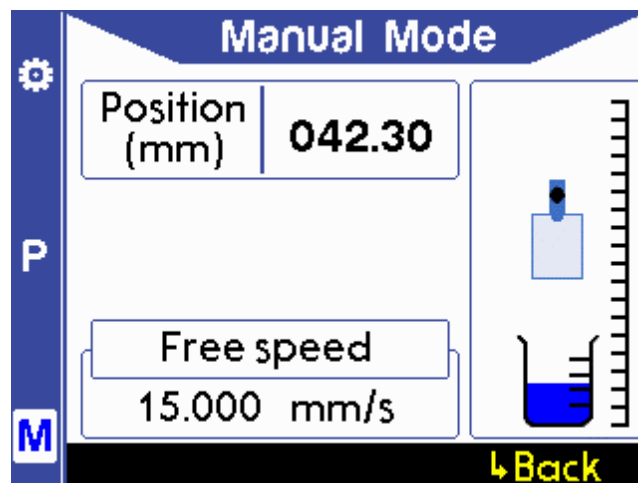
6. To set the Free speed, press OK to enter edit mode. To change the value, press the left or right button to navigate between the digits and press the up or down button to increase or decrease the selected digit. Press OK again to exit the edit mode.

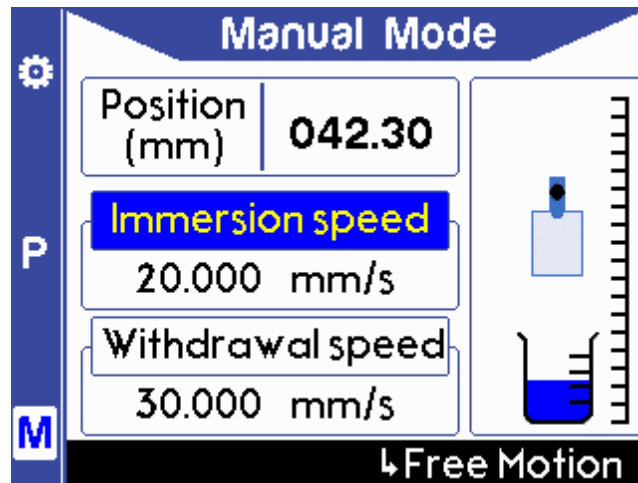


7. To operate the clamping arm, press the left button to select the diagram on the screen. Then, press the up or down button to move the arm based on the set speed.



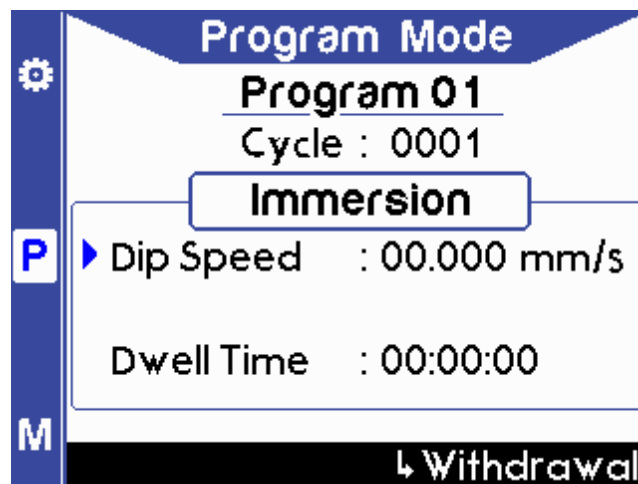
8. You can navigate to a previous page by selecting 'Back' at the bottom of the screen and pressing OK.





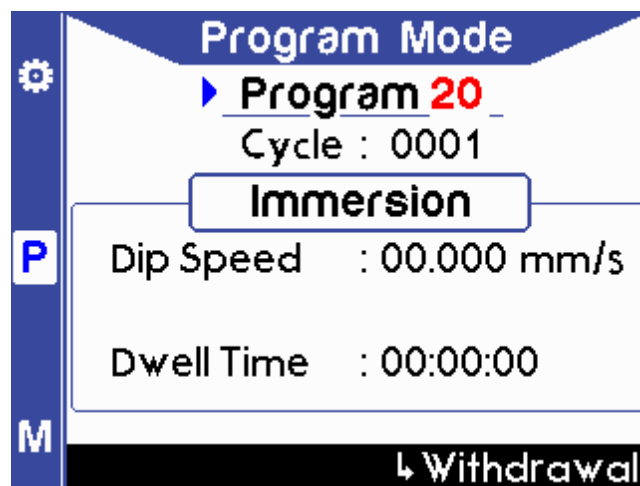
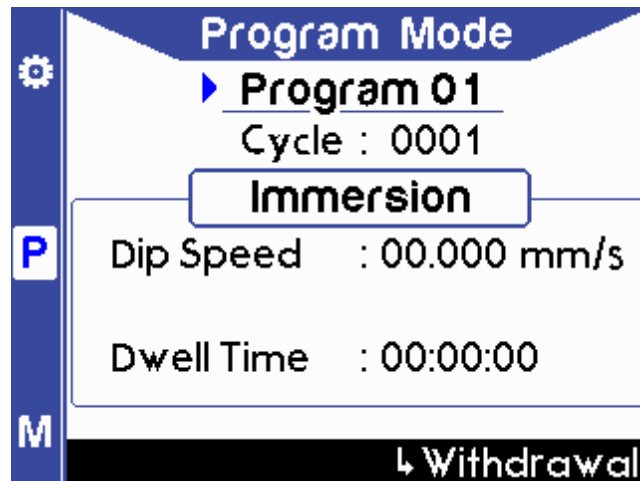
#### 8.4.4 Program Mode

1. To enter 'Program Mode', press the P button on the left-hand side of the screen.



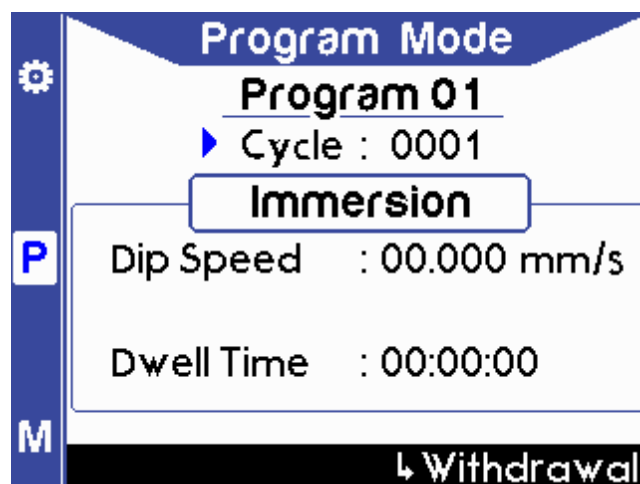
2. To set the program number, navigate by pressing the up button, then press OK to enter edit mode. To change the value, press the up or down button and press OK again to exit edit mode.

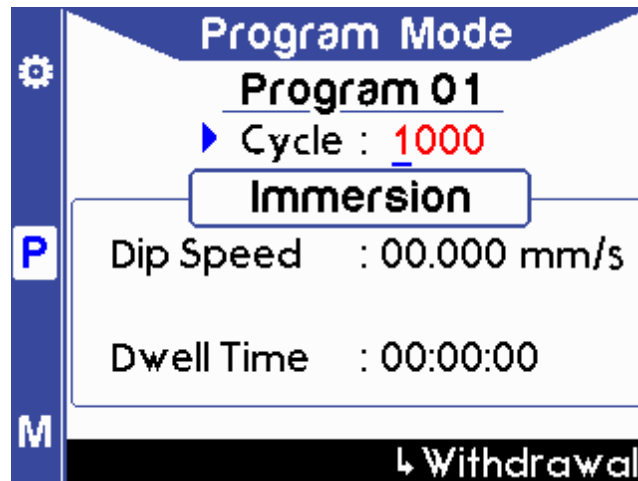
Note: The maximum number of programs is 20.



- To set the number of cycles, navigate to 'Cycle' by pressing the down button and press OK to enter edit mode. To change the value, press the left or right button to navigate between the digits, and press the up or down button to increase or decrease the selected digit. Press OK again to exit the edit mode.

Note: The maximum number of cycles is 1000.

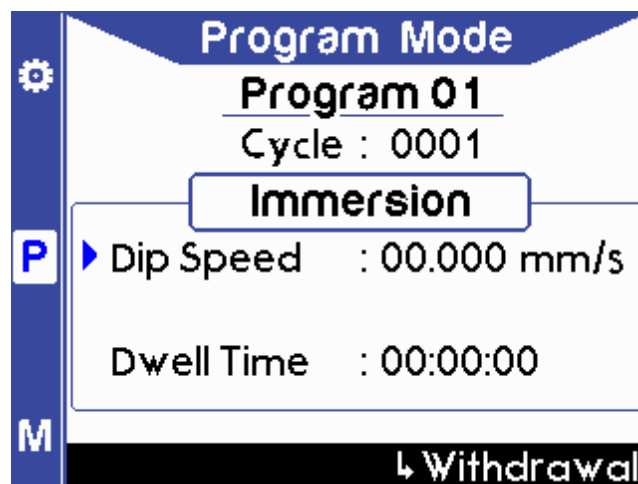


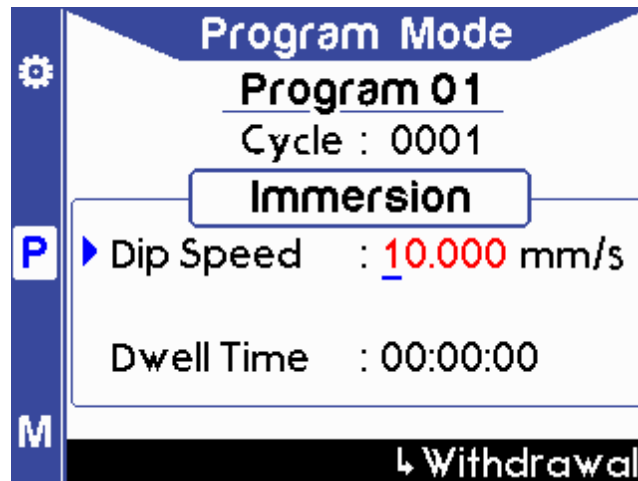


4. To set the immersion speed, navigate to 'Dip Speed' by pressing the down button, and press OK to enter edit mode. To change the value, press the left or right button to navigate between the digits, and press the up or down button to increase or decrease the selected digit. Press OK again to exit the edit mode.

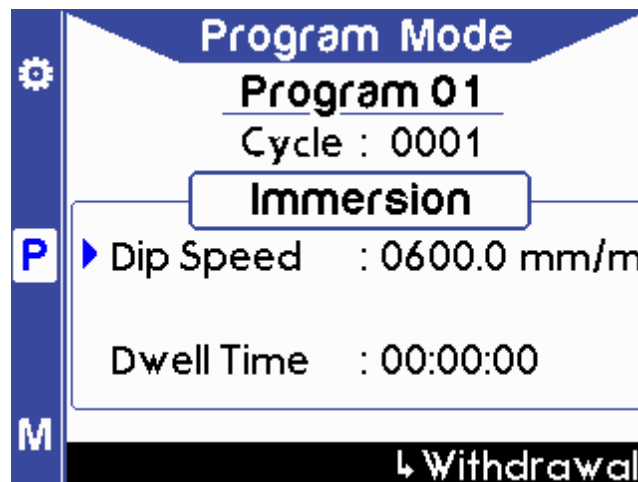
Note: The maximum Dip Speed is 50 mm/s or 3000 mm/min

- a) Unit in mm/s



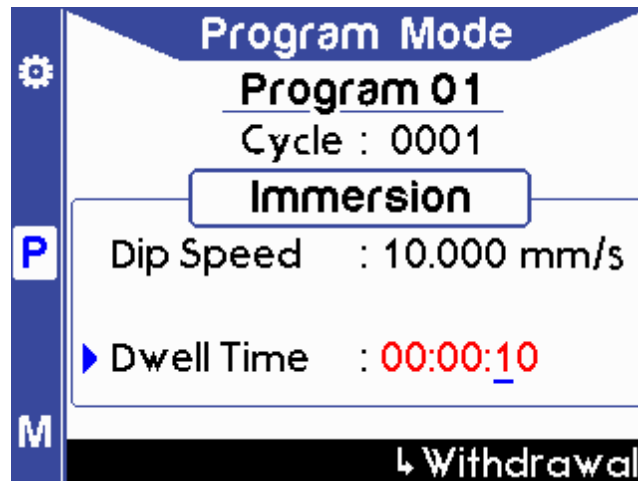


b) Unit in mm/min

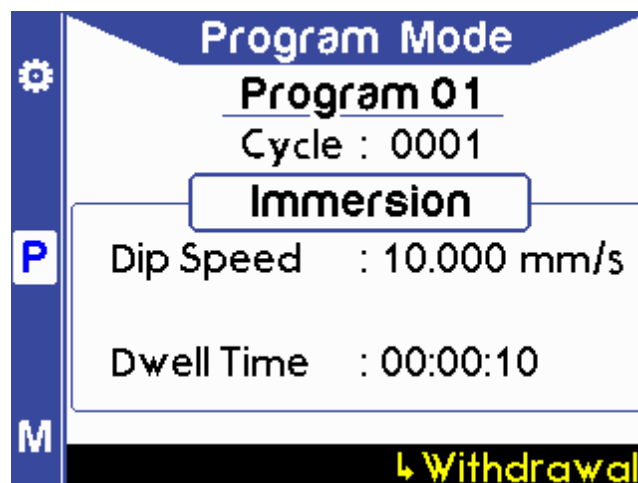


5. To set the 'Dwell Time', navigate to it by pressing the down button, then press the OK button to enter edit mode. To change the value, press the left or right button to navigate between the digits, and press the up or down button to increase or decrease the selected digit. Press OK again to exit the edit mode.

Note: The Dwell Time format is: HH:MM:SS (H = Hour, M = Minute, S = Second).



6. To enter the withdrawal page, navigate to 'Withdrawal' at the bottom of the screen until it is highlighted in yellow, then press OK.

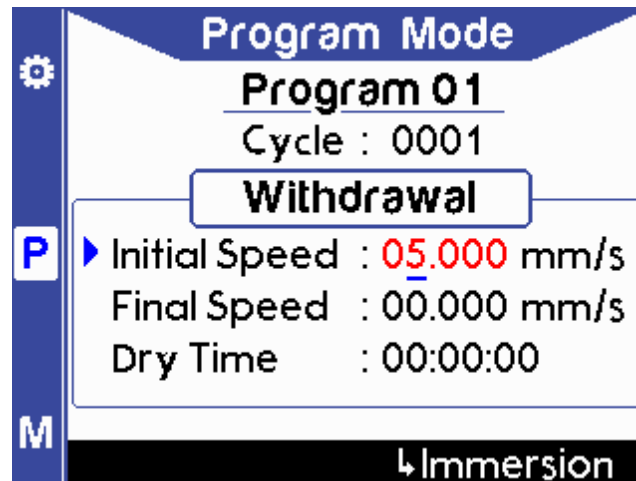
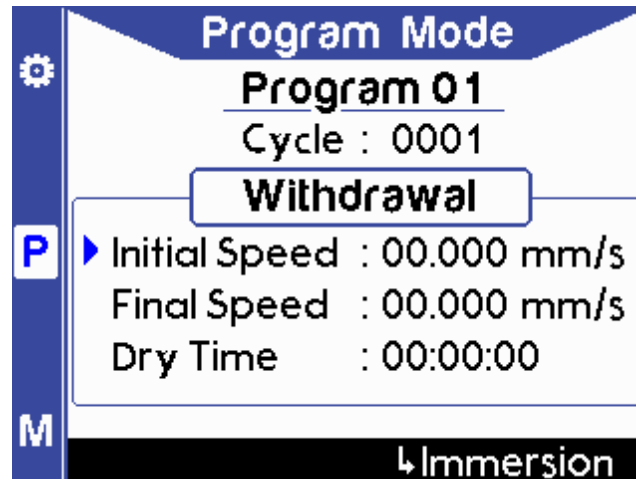


7. To set the initial withdrawal speed, navigate to 'Initial Speed' by pressing the down button, and press the OK button to enter edit mode. To change the value, press the left or right button to navigate between the digits, and press the up or down button to increase or decrease the selected digit. Press OK again to exit the edit mode.

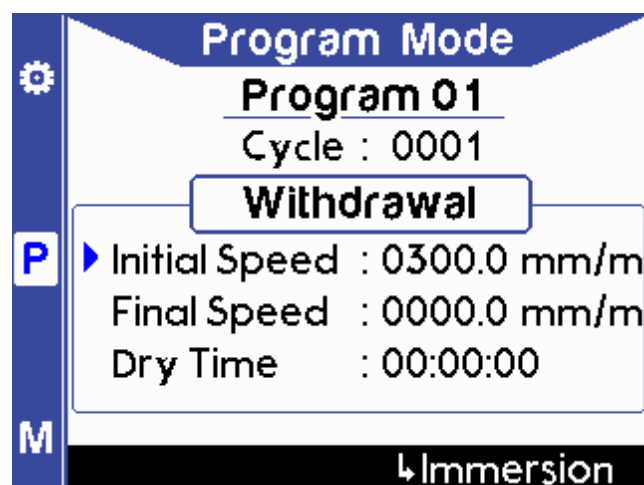
Note: The maximum initial withdrawal speed is 50 mm/s or 3000 mm/min



a) Unit in mm/min



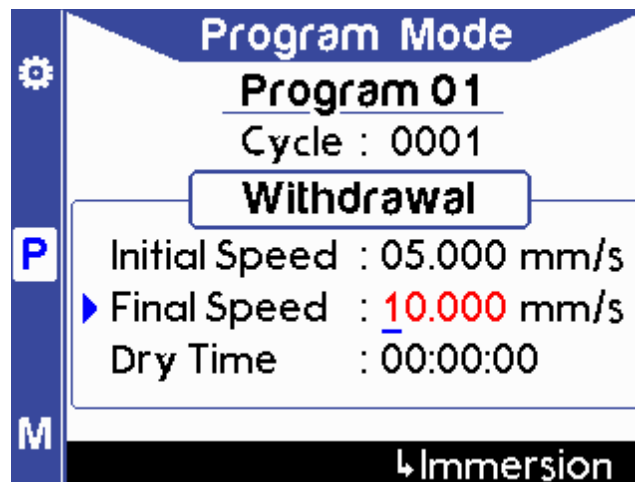
b) Unit in mm/min



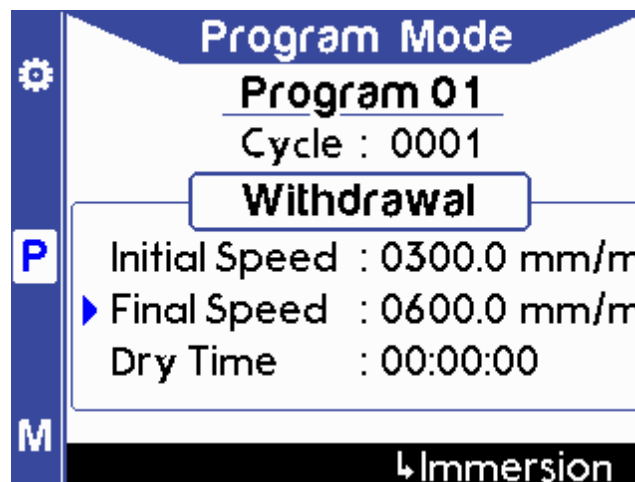
8. To set the final withdrawal speed, navigate to 'Final Speed' by pressing the down button, and press the OK button to enter edit mode. To change the value, press the left or right button to navigate between the digits, and press the up or down button to increase or decrease the selected digit. Press OK again to exit the edit mode.

Note: The maximum Final Withdrawal Speed is 50 mm/s or 3000 mm/min

a) Unit in mm/s

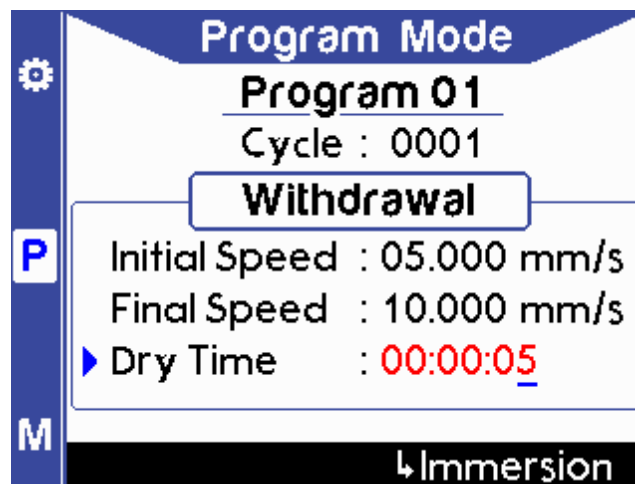


b) Unit in mm/min

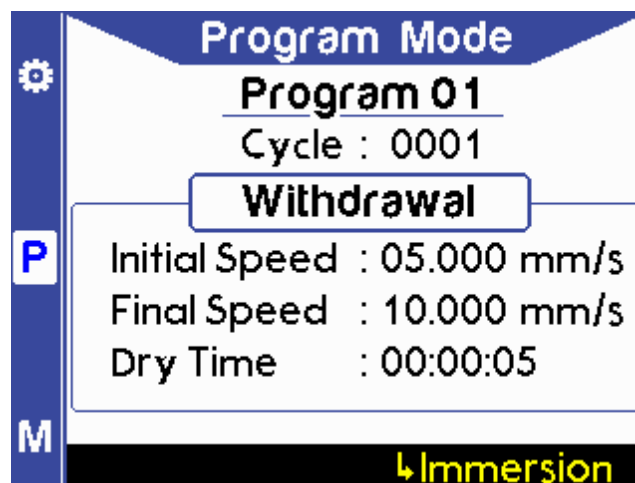


9. To adjust the dry time, navigate to 'dry time' by pressing the down button, and press the OK button to enter edit mode. To change the value, press the left or right button to navigate between the digits, and press the up or down button to increase or decrease the selected digit. Press OK again to exit the edit mode.

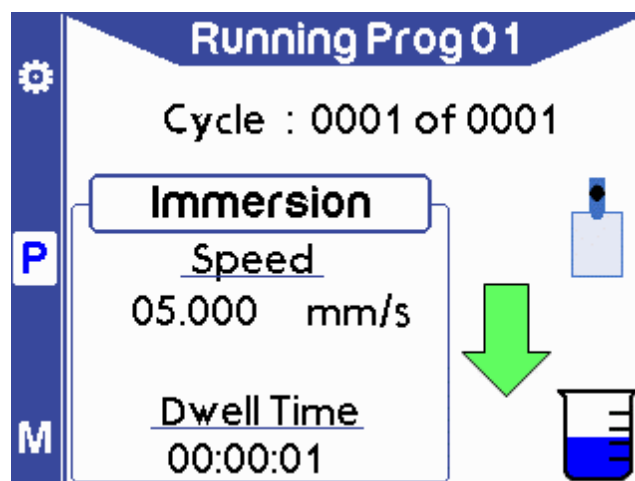
Note: The dry time format is: HH:MM:SS; (H = Hour, M = Minute, S = Second).

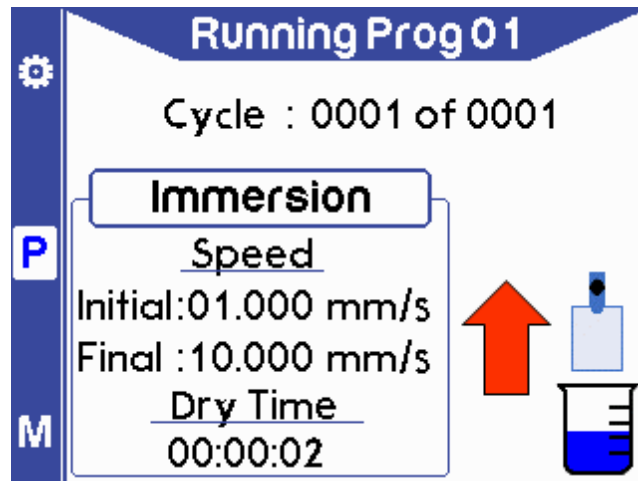


10. To return to the immersion page, navigate to 'Immersion' at the bottom of the screen until it is highlighted in yellow, then press OK.

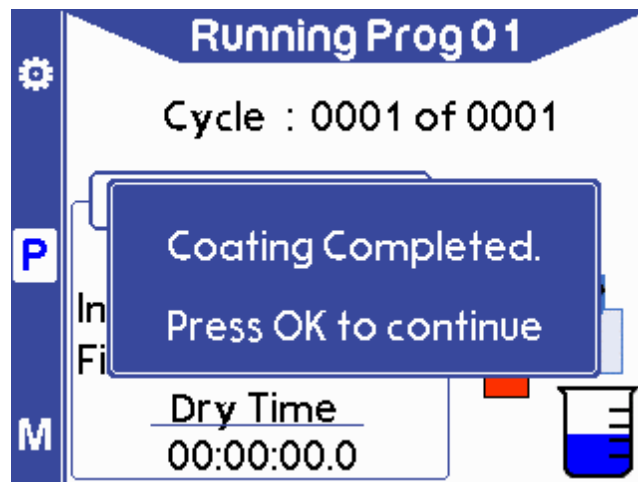


11. Once the all the values have been set, press the START button to run the program.



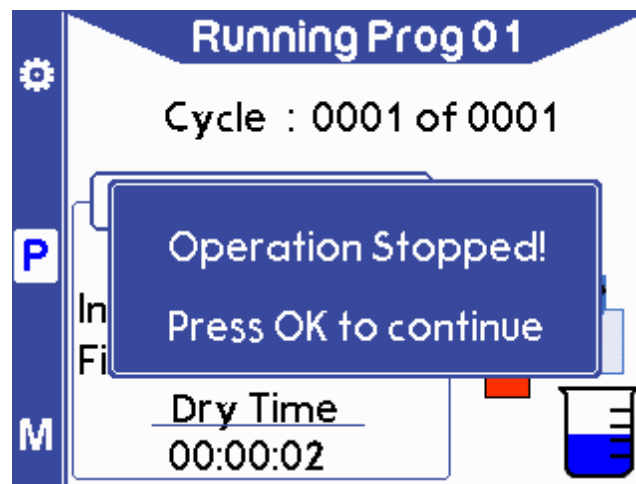


12. Once the coating cycle has been completed, the following message will appear:



Note: A warning will appear if any of the conditions below occur.

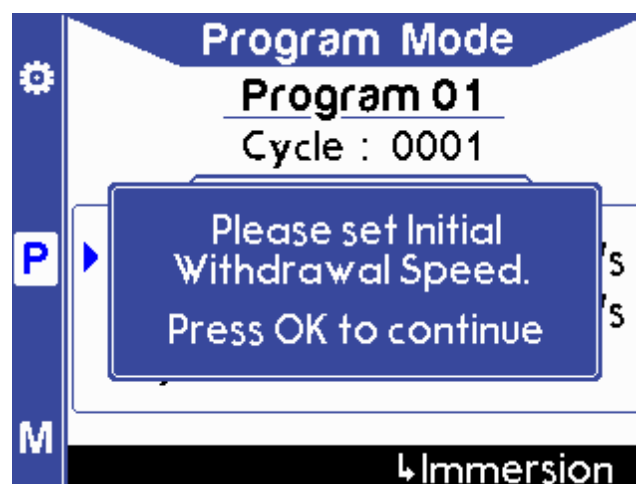
- a) Operation has been stopped by pressing the STOP button.



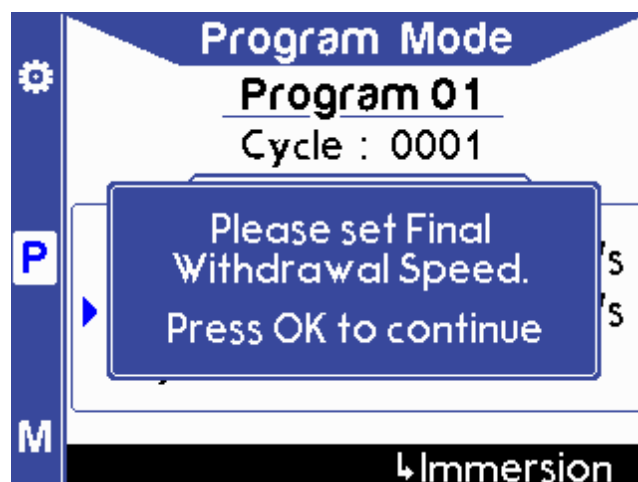
b) Immersion – Dip speed not set.



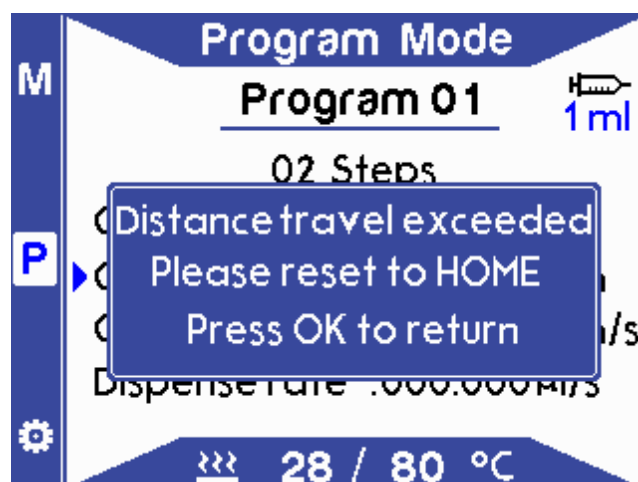
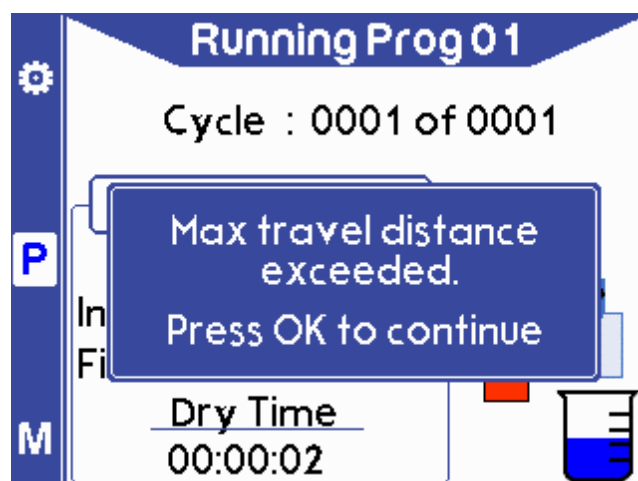
c) Withdrawal – Initial speed not set.



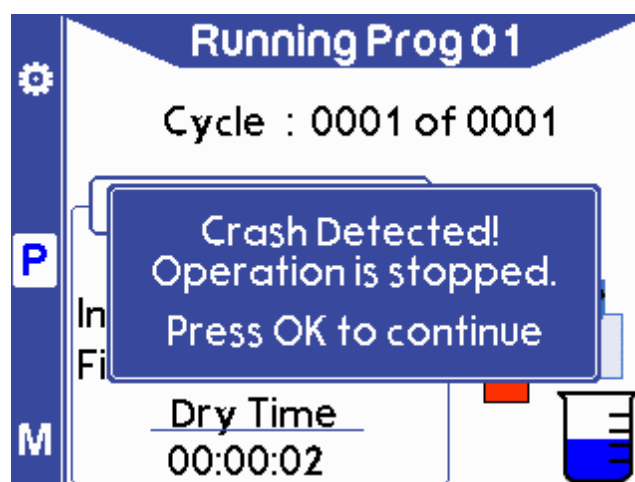
d) Withdrawal – Final speed not set.



e) When the maximum travel distance exceeds 100 mm a warning will be given.



- f) Crash detected between substrate and other hard surface (e.g. beaker or base of the case).



## 8.5 Operational Safety

Any procedure that is done with the Dip Coater should be carried out with a suitable operating procedure, risk assessment, and COSHH forms to ensure that the user knows and understands the potential hazards inherent to the system of work they are undertaking. The following are safety points that should be noted by the user before any procedure is undertaken with the Dip Coater.

### 8.5.1 Pinch Points

The dip coating arm presents the risk of a pinch point to the user. We recommend that users do not place their hands near the moving parts while a programme is running or during the manual movement of the Dip Coater.

### 8.5.2 Sources of Ignition

Solvents can often be highly volatile, with some having flash and flame points below that of room temperature. To minimise the risk of fire with solutions in use, users should ensure that no sources of ignition are placed close to the dip coating system. In the case of using any hazardous solvents the system should be housed in a fume hood where solvent vapour cannot accumulate.

## 9. Maintenance

### 9.1 Cleaning

Maintenance consists of periodic cleaning. The exterior of the instrument can be cleaned with a clean, dry cloth to remove any oil, grease, or grime. Never use liquid solvents or detergents. Repairs or servicing not covered in this manual should only be performed by qualified personnel.

## 10. Troubleshooting

Problem	Possible cause	Action
No power / display	<ul style="list-style-type: none"><li>a.) The power switch on the unit is in the OFF position</li><li>b.) The power supply may not be connected properly</li><li>c.) The fuse on the rear panel has blown</li><li>d.) The power supply adapter has a fault</li><li>e.) No obvious cause</li></ul>	<ul style="list-style-type: none"><li>a.) Check the connection and ensure the power is turned ON</li><li>b.) Ensure the unit is firmly plugged in to the power supply, and the plug is firmly connected to both the adapter and the working power socket</li><li>c.) Ensure the unit is unplugged. Check the fuse on the rear panel. If it has blown, replace with a suitably rated 1A slow blow fuse</li><li>d.) Contact Ossila for a replacement power supply adapter</li><li>e.) If all the above causes have been considered, there may be a fault on the board. Please contact Ossila for information</li></ul>



Problem	Possible cause	Action
Crash warning	<ul style="list-style-type: none"> <li>a.) The safety switch in the crash switch housing has not been returned to its ON state</li> <li>b.) The safety switch in the crash switch housing has developed a fault</li> </ul>	<ul style="list-style-type: none"> <li>a.) Ensure that the arm position is returned to its initial position and that no obstruction to the arms movement remains</li> <li>b.) If the above has not resolved the issue, please contact Ossila for more information</li> </ul>
System error	<ul style="list-style-type: none"> <li>a.) The secondary safety switch has accidentally been triggered</li> <li>b.) Internal fault in the secondary safety switch</li> </ul>	<ul style="list-style-type: none"> <li>a.) Turn the unit off and on again to see if the warning remains</li> <li>b.) If all the above has been considered there may be a fault with the secondary safety switch. Contact Ossila for more information</li> </ul>