

# iMatrixSpray User Manual

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V2.3

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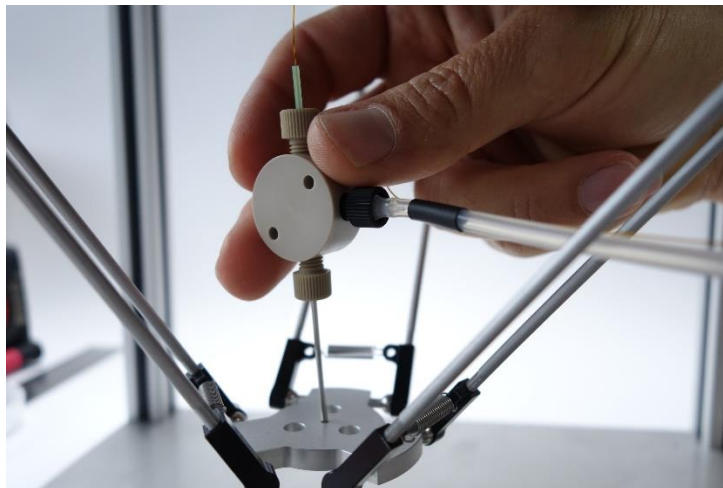
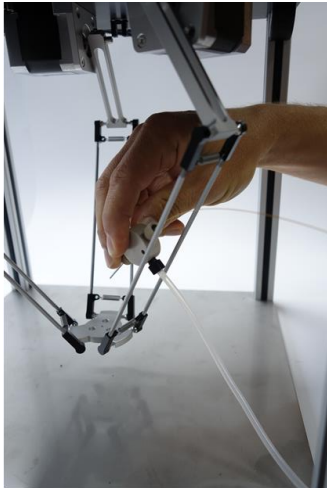
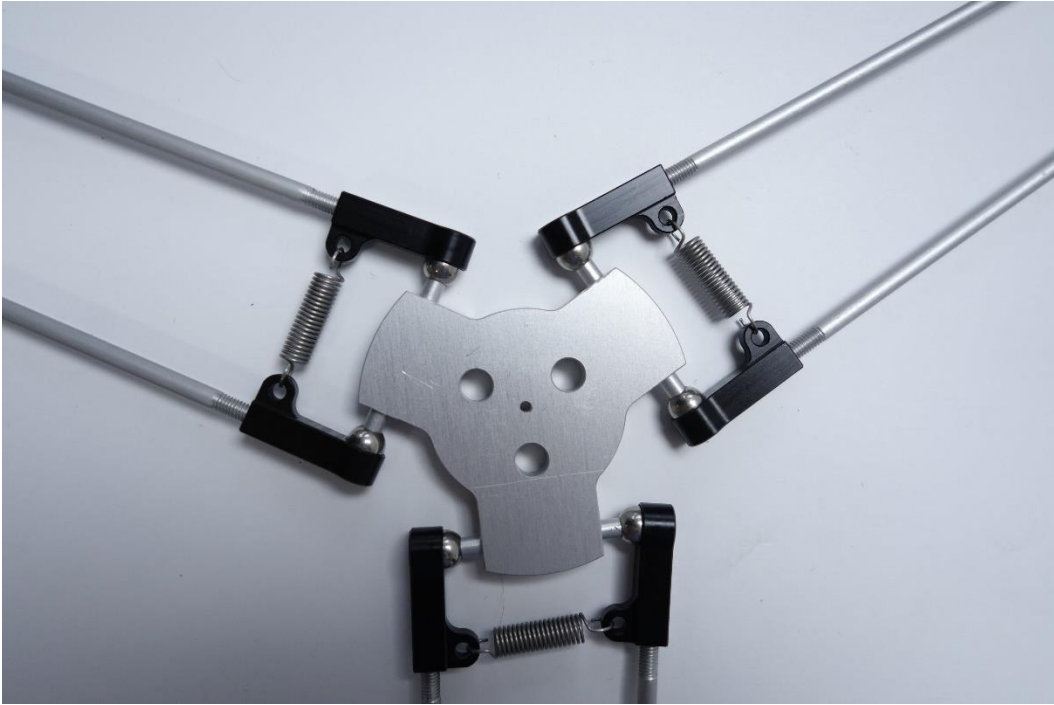
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**△ Warning:** The iMatrixSpray must be assembled and operated with adequate personal protection. If anything other than water is sprayed, the device must be operated in a fume hood.

## Quickstart

1. If the spray is not assembled, connect the 6 rods (2 connected each by springs) to the upper arms and the lower base. Ensure free movement.
2. Push the steel capillary of the spray through the whole in the lower base. Place an open vial under the spray to prevent it from touching the base. Make sure that the glass capillary extends 0.5 mm beyond the stainless steel tube. If adjustment is needed, loosen the nut at the back and move the capillary to the appropriate position.
3. Route the capillary and gas tube between the rods at the right side of the iMatrixSpray and through the plastic-lined whole in the upper plate.
4. Connect the spray capillary to the valve and the gas tube to the outlet below.  
**△ Caution:** The capillary can damage the valve if it extends beyond the sleeve! If it moves back and forth, use a piece of tape to fix it to the back of the sleeve before mounting it.
5. Supply compressed air or nitrogen with a pressure of 1.5 to 10 bar (0.15 to 1 MPa) to the back of the system by a 6 mm tube.
6. Connect the USB cable at the back of the iMatrixSpray from the controller to the server.
7. Plug the WLAN key into the remaining USB port.  
Alternatively, connect a LAN cable to the back of the device.
8. Connect a power cord to the power supply and plug the low voltage connector to the back of the iMatrixSpray. Press the power button on the front and it will illuminate. System boot time is less than 2 minutes.
9. Enable WLAN on your device and look for a network with the SSID 'iMatrixSpray'. Connect to it and use 0000000000 (10 times zero) as password. Depending on the system you are using, there will be a warning on limited connectivity. This is normal, as the iMatrixSpray does not connect to the internet.
10. Use your favorite web browser and connect to <http://10.10.10.10>  
If connected by LAN, the device obtains an IP address over DHCP. Use a network tool like FING to determine the address of the iMatrixSpray and connect to it.
11. Once you see the web interface, press the home button. If the iMatrixSpray moves, setup is completed.





## Programming your own methods

The iMatrixSpray was designed to allow full customization and you may program your own methods and upload/execute them on the iMatrixSpray. The system is based on standard gcode as it is also used in most 3d printing devices. These are the supported commands:

G1 <coordinate><value> [F<feed rate in mm/min>] Movement

Example:

G1 Z-50 moves the nozzle 10 mm down

G1 X20 Y10.5 F20 moves the nozzle at a speed of 20 mm/s to the new position

G1 V3 F100 turns the valve to position 1 (solution 1)

G1 P10 F100 aspirates 10 mm

G28 [<coordinates>] Initialize

all your routines should start with G28

Examples:

G28 initialize all coordinates

G28 P initialize syringe pump

G28 XYZ initialize all axis

M82 Syringe pump in absolute mode

M83 Syringe pump in relative mode  
all G1 P commands will be relative to previous position

M106 turn gas on

M106 S0 turn gas off

M18 turn motors off  
always end your procedure with this command

G4 S<seconds>  
wait for the specified duration in seconds

Example protocol:

```
; absolute mode
M82
; go to wash position
G1 Z-35.0 F200
G1 X0.0 Y-110.0 Z-35.0 F200
G1 Z-50.0
; switch gas flow on
M106
; aspirate 80 uL of wash solution
G1 V1.5 F200
G4 S1
G1 P4.8 F200
G1 V2 F200
G4 S2
; spray while moving to center
G1 V1 F200
G4 S1
G1 Y0.0 P0 F5
; switch gas flow off
M106 S0
; parking spray
G1 Z-35.0 F200
G1 X0 Y0 Z-35 F200
G1 Z0 F200
; motors off
M18
```

## Software Update

The iMatrixSpray runs on two different pieces of software: deltaSpray derived from Marlin on an Arduino Mega 2560 board and iMatrixSpray based on OctoPrint running on a Raspberry Pi board.

### Updating the Arduino Board

The Arduino development environment is a generic platform allowing rapid development. The software is uploaded by connecting the device to the USB port of a host computer (MAC, Windows, Linux) running the Arduino software. In case the iMatrixSpray firmware requires updating, follow this procedure:

1. Download the latest Arduino software from <http://www.arduino.cc> and install it to your host computer.
2. Disconnect the iMatrixSpray from the power
3. Disconnect one side of the USB Cable at the back of the iMatrixSpray and connect it to the computer. The computer will recognize the device and reports a COM port.
4. Download the latest firmware from <https://github.com/stoeckli/deltaSpray/archive/master.zip> and uninstall it into a folder of your choice.
5. Open the Firmware by double-clicking on Marlin.pde
6. Before uploading your firmware, you need to select the correct items from the Tools > Board and Tools > Serial Port and Board menus. On the Mac, the serial port is probably something like /dev/tty.usbmodem241. On Windows, it's probably COM1 or COM2. On Linux, it should be /dev/ttyUSB0, /dev/ttyUSB1 or similar. The board is an *Arduino Mega 2560 or Mega ADK Board*.
7. Once you've selected the correct serial port and board, press the upload button (→) in the toolbar or select the Upload item from the File menu. The Arduino environment will display a message when the upload is complete, or show an error.

### Updating the Ardino Board

The iMatrixSpray user interface is a modified version of OctoPrint. You may build your own system based on the code found at <https://github.com/stoeckli/iMatrixSpray> or you may download the compiled image from this location. Use the "Win32 Disk Imager" from <http://sourceforge.net/projects/win32diskimager/> to write this image to the inserted SD Card and consult the Raspberry Pi documentation for more information.

## Troubleshooting

The iMatrixSpray was designed and manufactured to run with minimal user interaction. The steps below help you if things don't work as expected. If the faulty condition persists, please report to the forum.

Any issue	<ul style="list-style-type: none"><li>• Switch off, wait 10 seconds and switch on. After two minutes the system has rebooted.</li></ul>
No WLAN connection	<ul style="list-style-type: none"><li>• Move with your device closer to the system</li><li>• Disable/Enable WLAN on your device</li><li>• Connect to the WLAN with SSID "iMatrixSpray" and password "0000000000"</li></ul>
Webserver not responding	<ul style="list-style-type: none"><li>• Check on WLAN connection (see above)</li><li>• Connect to <a href="http://10.10.10.10">http://10.10.10.10</a></li></ul>
Live View not showing	<ul style="list-style-type: none"><li>• Versions of IE and FF don't support inline display of MPG4. Use Chrome instead or connect to the video stream through the Windows Media Player by connecting to <a href="http://10.10.10.10:8080">http://10.10.10.10:8080</a></li></ul>
Drops instead of spray	<ul style="list-style-type: none"><li>• Check the pressure regulator for a pressure of 1 to 1.2 bar. Connect the compressed gas to the back of the system and adjust the pressure by pulling out the knob and turning it.</li></ul>
Uneven spray	<ul style="list-style-type: none"><li>• Ensure that the capillary ends 0.5 mm below the stainless steel capillary and that the pressure is 1 to 1.2 bar (0.1 to 0.12 MPa).</li></ul>



## Warranty and Disclaimer (“Agreement”)

The iMatrixSpray is sold as kit only. You have all the flexibility to assemble, modify and re-program the device to your needs. For this reason, we only warrant for the parts in the kit, but not for the operation of the device:

iMatrixSpray warrants the parts, and only the parts, against defects in materials and workmanship under normal use for a period of 24 months from the date of purchase shown on the receipt by the original purchaser (“Warranty Period”).

Under this warranty, if a hardware defect arises and a valid claim is received by iMatrixSpray within the Warranty Period, iMatrixSpray will repair your product or replace it, as appropriate and at our discretion, with the same or an equivalent model, free of charge. Shipping costs to our repair center are the responsibility of the owner. Any repairs made will restore the intended functionality. While repairs will be made professionally, we cannot guarantee the original appearance to be preserved. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state or country to country.

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