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Handling, Maintenance, and Storage Guidelines for Spray Ink PSPI-1000 (Version 4.0, updated June 2021)

(1) Appearance of the ink when you receive it

- The ink will be black in color and will have a low viscosity

(2) Storage of the ink when you receive it

- The ink should be stored in a refrigerator at a temperature between 2 and 9 degrees Celsius
- Do not freeze the ink

(3) Optimal pH range of the ink during printing

- The pH of the ink should be maintained at a value between 5.70 and 5.95 (at a temperature between 20 and 23 degrees Celsius) while it is printed

(4) How to adjust pH of the ink

- Remove the ink from the refrigerator and allow it to warm up to room temperature
- Prepare a 0.50 % wt. solution of ammonium hydroxide (pH-increasing solution). Use deionized water and a high purity grade of ammonium hydroxide (e.g. cleanroom grade) to prepare the solution. Store the solution in the refrigerator. It has a maximum shelf life of 10 days.
- Calibrate your pH probe in buffer solutions of pH 4 and pH 7. For laboratory use, we recommend Hanna Instruments FC210B or FC240B pH probes.
- Place the calibrated pH probe in the ink and begin to mix the ink at a low speed
- A stainless steel spatula or a small handheld mixer or the pH probe itself may be used for mixing small masses of ink (≤ 500 g) and an overhead mixer may be used for larger masses of ink (> 500 g)
- Add in a dropwise fashion the 0.50 % wt. solution of ammonium hydroxide to the mixing ink until the target pH of the ink is achieved
- Stop the mixing of the ink and remove the pH probe when the target pH is achieved
- The ink is now ready to be used or stored
- Do not increase the pH of the ink above 6.05

(5) Appearance of the ink when the pH is changed

- The ink is more viscous when the pH is less than 5.70
- The ink has low viscosity when the pH is between 5.70 and 5.95
- The ink is more viscous when the pH is greater than 6.05 and will undergo irreversible nanoparticle agglomeration

(6) Handling of the ink before it is printed with an airbrush or other spray system

- Remove the ink from the refrigerator and allow it to warm up to room temperature
- A stainless steel spatula or a small handheld mixer or the pH probe itself may be used for mixing small masses of ink (≤ 500 g) and an overhead mixer may be used for larger masses of ink (> 500 g)



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- Measure the pH of the ink with a calibrated pH probe while the ink is mixing
- If the pH of the ink is in the optimal pH range for printing (between 5.70 and 5.95), the ink is ready to be used
- If the pH of the ink is less than 5.70, the pH of the ink may be increased by following the procedure in (4) **How to adjust the pH of the ink**

(7) Cleaning the ink off equipment or any other surface

- Prepare a 1 L solution of “soapy water” with 1 part per volume of Dawn or Palmolive (or any particle-free or liquid detergent detergent) and 19 to 20 parts per volume of deionized water
- Pour the “soapy water” solution into a 1 L spray bottle
- Spray the “soapy water” onto the surface to be cleaned
- Wipe up the “soapy water” residue with paper towels or a foam wiper. The paper towels should be placed in a solid silver waste stream vessel.
- Spray deionized water onto the surface after all of the ink has been cleaned. Wipe clean with a paper towel or foam wiper.

(8) Storage of the ink after it has been printed with an airbrush or other spray system

- Transfer the ink to a container(s) with a small amount of headspace
- The ink may now be refrigerated between 2 and 9 degrees Celsius



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Web links to vendors which sell the laboratory-scale equipment and cleanroom-grade ammonium hydroxide which are used in ink pH adjustment at NovaCentrix:

(1) Oakton pH 5+ meter

<http://www.4oakton.com/proddetail.asp?parent=12&prod=375&seq=1&TotRec=9>

(2) Hanna Instruments FC210B pH probe

<https://hannainst.com/fc210b-foodcare-ph-electrode-for-milk-yogurt-and-creams.html>

(3) Oakton WD-35613-13 Automatic Temperature Compensation (ATC) Probe, Stainless Steel

<http://www.testequipmentdepot.com/oakton/probes-and-electrodes/atc-probes/automatic-temperature-compensation-atc-probe-ss-wd-35613-13.htm>

(4) Ammonia solution 29 %, Cleanroom MB for the electronics industry [manufactured by KMG]

<https://pr.vwr.com/store/product/9693443/ammonium-hydroxide-29-cleanroom-mb>

All questions about the ink or printing of the ink should be directed to **Ronald I. Dass** (ron.dass@novacentrix.com)