Elma Ultrasonic Wash for Form 3L Prints

Formlabs has collaborated with Elma Ultrasonic to create two customized automated cleaners, the P180H and P300H, to wash large parts printed on the Form 3L 3D printer. These customized cleaning products help to remove residual resin from newly printed parts.

The P180H and P300H use ultrasonic cleaning to wash away uncured resin on a printed part. Ultrasonic cleaners work through cavitation. Sound waves are emitted into the solvent at a precise frequency that creates powerful microscopic voids, or bubbles. These bubbles ultimately implode and scrub away uncured resin from the part, where it is then absorbed by the solvent. Since these bubbles are microscopic, they are able to clean any surface touched by the solvent.

Formlabs recommends the P180H and P300H for their large volume, fast and quiet operation, and two-year warranty from Elma. A tub and custom lid, compatible with both resin and solvent, are included.

Required Components
The following components are required when using either the P180H or P300H Elma ultrasonic cleaner to wash parts printed on the Form 3L:

- Form 3L 3D printer
- Form 3L build platform
- Elma P180H or P300H ultrasonic cleaner
- Elma P180H or P300H plastic tub and lid
- Gloves
- Cleaning solvents
  - Soap and water
  - Tripropylene glycol monomethyl ether (TPM)

Wash Setup
The following steps are recommended when setting up the Elma ultrasonic cleaner:

1. Fill the stainless steel cleaning tank with a 1% soap and water solution (3 liters for the P180H and 4 liters for the P300H). The soap reduces the surface tension of the water, while the overall solution serves to transfer the ultrasonic energy to the plastic tub.
2. Select degassing mode* on the ultrasonic cleaner, set the frequency to 37 kHZ, ensure no heat is selected, and run for 15 minutes.
3. Insert the plastic tub** into the steel tank. The plastic tub will float slightly in the soap and water solution. Wiggle the tub around in the tank to try and remove as many of the air bubbles as possible.
4. Fill the plastic tub with TPM solvent. Ensure that the tub is filled with enough solvent so that the part is fully submerged, but the solvent remains at least 1 in from the top of the tub.

5. Select degassing mode* on the cleaner, set the frequency to 37 kHz, ensure no heat is selected, and run for 15 minutes.

6. While wearing gloves, remove the part to be cleaned from the Form 3L build platform. Insert the part into the plastic tub filled with TPM. Place the lid on the plastic tub to reduce the odor from the TPM.

* Ultrasonic cleaners rely on a medium to transmit ultrasonic energy from the transducers to the surface of the part. Dissolved gas in the transfer medium can act as a dampener, which reduces the efficiency of the machine and slows the cleaning process. Run the degassing mode anytime new solution is placed in either the stainless steel container or plastic tub.

** Both the P180H and P300H Elma ultrasonic cleaners come with a plastic tub that sits inside the stainless steel cleaning tank. Use the plastic tub when washing parts in the ultrasonic cleaner.

Wash Settings for Cleaning Parts

Use the following settings when operating the P180H or P300H Elma ultrasonic cleaners.

**Frequency:** 80 kHz

80 kHz is recommended as it is quiet and gentle on the surface of parts. If faster washing is desired, 37 kHz can be selected.

**Power:** 100%

When using the 80 kHz frequency settings, the power setting can be set at 100% for faster washing. If the 37 kHz frequency setting is used, the power level may need to be adjusted to reduce the likelihood of part damage such as pitting.

**Mode:** Sweep

Sweep mode slightly modulates the frequency of the ultrasonic energy, ensuring even cleaning of all surfaces.

**Heat:** Off

The cleaner naturally heats up from the ultrasonic energy, which increases the cleaning efficacy. No additional heat is required. TPM is safe to heat up to 90° C, but higher temperatures could damage parts and increase the odor of the TPM.

**Time:** 15 minutes
Cleaning efficacy depends on part geometry and the specific resin being washed. In general, 15 minutes is recommended for initial cleaning, but parts can be cleaned longer if necessary as TPM is less damaging to parts than other solvents such as isopropyl alcohol (IPA). Inspect the part for residual resin after the first wash and run the ultrasonic cleaner again if necessary.

**Water Rinse**

1. After washing in the ultrasonic cleaner, remove the part to drip dry. Note that the TPM will not fully evaporate while drip drying.
2. Place the part into a soapy water solution for 30–45 minutes to remove the TPM from the surface of the part.
3. Remove the part from the soapy water solution and let the part drip dry. Once dry, the part can be cured.

**FAQ**

1. Why is TPM the recommended solvent?
   After rigorous testing, TPM was chosen as it is non-flammable, has a high resin absorption rate, has a low evaporation rate, and is readily available.
2. Are there other solvents that could work with the ultrasonic cleaners?
   TPM is the only method Formlabs and Tovatech recommend. Organic solvents with a low flashpoint, such as IPA, should be used with extreme caution as sonicating can create a flammable atmosphere.
3. Is this process validated for all Formlabs resins?
   The ultrasonic wash process described above is validated for all Formlabs resins.
4. When should the TPM and/or soapy water be replaced?
   TPM should be changed when the resin is no longer washed off of the part. This means the TPM is fully saturated with resin. The soapy water should be replaced when the tub is no longer in contact with the steel tank.