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## Painting Instruction Guide

For all coatings, always re-suspend the coating before use. If diluting, make sure the paint is uniformly diluted. For any method, make sure that the substrate is cleaned from any oils or surface dust: painting onto dust is like painting over sawdust, where the paint adheres to the sawdust and not to the underlying board.

### I. **SURFACE PREPARATION:** This is very important for any substrate and any application technique. Here are some notes on this –

#### FOR METALS:

Most coating failures are due to inadequate surface preparation. Cleaning to remove surface oils, greases, and dirt, rust, scale, dust is essential to getting optimum coating adherence.

- A. **Blasting:** Grit blasting is a very good way to get a slightly roughened surface for improving adherence and also for getting off surface contaminants ... but ... after blasting, the surface then needs to be cleaned of any dust from the blasting operation.
- B. **Burn-Off:** By heating to around 400 C (750 F), organics will be removed ... but typically leaves a residue that needs removal by mechanical means.
- C. **Mechanical Cleaning:** This can be done to remove residues prior to solvent cleaning – vacuum-cleaning or air-jet-blowing or just wiping the surface can be done.
- D. **Solvent Cleaning:** Using a strong solvent (such as MethylEthylKetone [MEK]) is effective in removing oils, greases, and most contaminants.

#### FOR CERAMICS:

Ceramics (including Graphite) are more “forgiving” to coat than metals in terms of surface preparation. It is still necessary to remove any loose dust and obvious contaminants. Pre-heating the surface to around 200-300 C (400-600 F) followed by cooling to room temperature to re-coat can fix many situations that “could” arise from pH differences of the coating and the binders used for some ceramics. With very porous ceramics, prewetting with water can prevent a “suck” of the coating liquid that can lead to weakened bond-down of the coatings.

### II. **APPLICATION BY BRUSHING**

**Brushing onto a substrate heated to around 40-50 C [100 to 125 F] can facilitate drying; however if the substrate is too hot, a brush can 'drag'/'glue' down to the substrate.**

Apply a thin/uniform layer of paint – just like ordinary housepaint. Use either a foam rubber brush (best for viscous paints) or a bristle brush.

Avoid thick layers of paint, since they tend to crack on drying and are much more likely to spall during cooldown from elevated temperature.

Allow to thoroughly dry at room temperature before heating. If force-dried, do so

Below 70 C (< 160 F), since drying at too high a temperature can “bubble-up” areas of the coating. Note that heating of “wet” coating will cause areas to de-bond and lead to spalling.

### III. APPLICATION BY AIR SPRAYING

**If possible, use a heated substrate between 150 and 200C [300-400 F] for spraying water-based coatings. Air-spraying a water-based coating onto a heated surface will lead to immediate drying, such that the coating goes down like if using an aerosol-can.**

Use a “704-FF Air Tip, Needle” (or nozzle) or its equivalent to get the best non-clogging spray from our coatings.

Avoid heavy spray coatings. A 2-4 mil (0.002-0.004 inch or 0.05-0.1 mm) layer is ideal for most substrates. Build up the thickness slowly to avoid running.

Use short bursts rather than a continuous spray – allowing maximum control during spraying.

Maintain a 6-12 inch distance from the substrate. Getting too close leads to running of the paint, whereas getting too far away lets the “mist” partly dry before hitting the substrate and thus reduces the adherence of the coating.

Maintain proper gun and tank air pressure. Too high or too low pressure causes spotting of the coating: when these are not correct, the paint sprays more as small blobs rather than as a uniform mist.

Use a sweeping motion for the gun. Change the spray angle often in order to cover all pores, crevices, etc. Do not hold the spray-gun in one spot when spraying. Start the spray while not directed at the substrate when possible. Air spray guns often shoot out a heavy stream on startup until the correct air/coating mix is achieved.

Adjust the spray-cone-angle for the best coverage using the spray-gun adjustments.

Always clean up the equipment after each use; residual paint can lead to clogging for future spraying. Also, be sure to use the appropriate ventilation and safety equipment: See MSDSs.

**RECOMMENDED EQUIPMENT** (which we have used very successfully with our coatings ... noting that other vendors similar/equivalent equipment should also work as well)

#### **DeVilbiss Conventional Spray Gun (Pressure-fed)**

##### **CATALOG NO. DESCRIPTION**

JGA-510-704-FF	Hand Spray Gun, Air Tip, Needle
TLC-576	1 qt. Aluminum Pressure Feed Cup
KK-4980	Regulator for Cup Air

#### **Spray Gun Troubleshooting**

#### **More DeVilbiss Information**

## **IV. APPLICATION BY DIPPING**

Dipping is not generally recommended, since a thick coating can result and drying from the outside of the coating to the inside can give the “appearance of a completely dry coating, whereas underlying moisture can lead to micro-delamination on heatup of the coating.

While dipping can be done with our coatings, it requires getting a thin, uniform layer – sometimes achieved by vibrating a dipped part to drain off the excess paint.

## **V. POSSIBLE COATING PROBLEMS AND THEIR CORRECTION**

Loss of adherence can occur for several reasons, leading to spalling and/or chalking of the coatings.

- A. During drying at room temperature
  1. From an unclean surface ... Clean thoroughly the surface of oils, scale, dirt, etc.
  2. From surface incompatibilities ... When the coating pH is different from or interacts with the substrate, this can cause problems – but can be remedied by first heating the part to be coated to around 200-300 C (400-600 F) and then cooling to room temperature to paint the part.
  3. From excessive paint dilution ... When some paints are overly diluted, the binder system is impaired, leading to less-than-optimum performance: this is remedied by reducing the dilution. Many paints can be diluted at up to 15% before this degradation of performance is noted. And some are designed for diluting to a great extent: read the Technical Data Sheet (TDS) before use/diluting. There is a Datasheet on each product on the ZYP website.
- B. During heating up to the use-temperature
  1. From a “wet” coating ... Residual water (dampness) can lead to spalling during the heatup: this can be remedied by making sure that the coating is thoroughly dry before heating up to its use-temperature.
  2. From surface incompatibilities ... When the coating pH is different from or interacts with the substrate, this can cause problems – but can be remedied by first heating the part to be coated to around 200-300 C (400-600 F) and then cooling to room temperature to paint the part.
- C. During cooling from the use-temperature
  1. From expansion/contraction differences ... Spalling during cooldown from use-temperature typically results from a mismatch in the expansion/contraction coefficients between the coating and substrate.
  2. From thick coatings ... The thicker the coating, the greater the tendency to spall or flake. This is remedied by applying thinner layers. **THIN IS ALWAYS BEST = THE RULE.**