

Simple Tests

Published now and again

by MIDWEST TUNGSTEN SERVICE

This TIPs contains a number of simple tests that you can perform at your desk without any special equipment. The results are more qualitative than quantitative, but are useful nonetheless. References to industry standard tests are included in case you want to investigate further.

ADHESION:

The well known Scotch Tape test. Using a sharp knife, score a crosshatch pattern into the part, six parallel lines an eighth inch apart, piercing all coating layers. Take a piece of tape (3M 4-9239) three inches long and fold a half inch of one end over on itself, creating a pull tab. Apply the sticky remainder over the hatching, pressing firmly and rubbing until you can see the part clearly under the tape. Rapidly peel the tape (without jerking) backward at a 180° angle. If no coating comes off, the coating passes the test. If some coating comes off near the scores, adhesion is considered fair. If coating is removed in the center of the squares, the coating has failed. Note which interface fails: substrate to basecoat, basecoat to metal, or metal to topcoat. Specifications for this test are spelled out in ASTM 3359.

Surface of cross-cut area from which flaking has occurred. (Example for 6 parallel cuts)	None					Greater than 65%
Classification	5	4	3	2	1	0

ABRASION:

This test uses the eraser of a standard pencil. It should be new. Using a uniform pressure of 2.5 pounds (use your best guess), make 10 strokes over the same path on the part. Judge the amount of abrasion that occurs. The same test can be performed with cheesecloth and varying grades of steel wool. Specifications for this test are spelled out in MIL-C-675.

BEND:

Wrap the coated material to be tested around a standard lead pencil, noting the amount of coating failure at each 45° interval as you bend. Bend as far around as is practical. The specifications for this test are spelled out in ASTM D522.

COLOR MATCH:

To compare two colors, view them side by side under a variety of lighting conditions, as colors change with light. Try fluorescent light, incandescent light, and natural light. Natural light is generally considered to be north daylight, not direct sunlight. Avoid ocular fatigue. Make your judgements within a minute and rest your eyes in between comparisons. Special light booths (color matching cabinets) are made for this purpose, also. Applicable standard is ASTM D1729.

FADE:

Use masking tape to secure a piece of black paper over on half of a part. Place the part in direct sunlight (southern exposure) or a UV light for 100 hours. Remove the paper and compare the two sides for evidence of color loss or change. Recover the part and keep testing as necessary. Standard is ASTM D2244.

HARDNESS:

There are sets of lead pencils used for drafting that have hardness levels indicated on them. Use numbers 1H to 4H. Hardness increases with the number. Flatten the lead to a chisel point. Push the chisel point into the coating at a 45° angle. If the lead breaks, the coating has passed this hardness level. Proceed to the next level. If the lead penetrates the coating, it has failed. ASTM D3363 covers this test.

OUTGASSING:

Some materials will outgas in the chamber. To assist in determining if this might be a problem, check with the supplier to see if any plasticizers are used in the material. Some materials, such as butyrates, are known outgassers. You can test a suspect part by pressing a part firmly between your hands for 30 seconds, using as much force as possible. If your hand feels tacky upon releasing the part, outgassing may be a problem. ASTM E595 is the specification to reference.

STATIC:

Plastic is notorious for accumulating a static charge. Some materials are worse than others. Rubbing a sample with a nylon or wool cloth in a dry environment will check to see if it accumulates a negative charge, while rubbing the sample with polyester will indicate if the sample accumulates a positive charge. When charged, the material will attract dust, ashes, or the hair on your arm. There are devices that can measure this charge (static meters) and dissipate it (ionizers). ASTM D4470 is the specification.

COATING UNIFORMITY:

Hold a coated and metallized part in front of you in a well lighted area. Rock the part back and forth while looking for rainbows, lines, or swirls. Using a louvered light source helps, or you can view the part through inexpensive polarizing plastic sheet that you can find on the internet to make the lines more visible. There are ultrasonic instruments which will measure coating thickness non-destructively. ASTM specification is D4138.

WETTABILITY:

Wettability is a factor in how well coatings will apply and stick. Does a drop of water form a tight bead or does it lay as a sheet across the surface? Parts that have poor wettability may require pretreatment such as flaming or corona discharge in order to make them wettable. The standard test for this is described in ASTM D7334.

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