

PosiTest® Pull-Off Adhesion Tester

Instruction Manual v1.0

Introduction

The portable, hand-operated PosiTest Pull-Off Adhesion Tester measures the force required to pull a specified test diameter of coating away from its substrate using hydraulic pressure. The pressure is displayed in both MPa and PSI on a precision dial indicator and can be related to the coating's strength of adhesion to the substrate.

In accordance with ASTM D4541-95 and ISO 4624, the PosiTest Pull-Off Adhesion Tester evaluates the adhesion (pull-off strength) of a coating by determining the greatest tensile pull off force that it can bear before detaching. Breaking points, demonstrated by fractured surfaces, occur along the weakest plane within the system consisting of the dolly, adhesive, coating layers and substrate.

There are a few basic steps for testing coating adhesion with a PosiTest Adhesion Tester:

1. Dolly & Coating Preparation

- The dolly and the coating are cleaned and abraded.

2. Adhesive & Dolly Application

- The adhesive is prepared and applied to the dolly. The dolly is then adhered to the coated surface and adhesive is allowed to cure.

3. Test Area Separation

- The test area of the coating is separated from the area surrounding the dolly by cutting or drilling. Drilling (50mm or 20mm dollies) must be done before dolly is adhered to the surface – cutting with hole-saw (20mm dollies only) should be done after dolly is adhered and adhesive is cured.

4. Pull-off Test

- After connecting actuator's quick-coupling to the dolly, pressure is pumped into the system and the dolly pulls the coating(s) away.

5. Analysis of Test Results

- The dolly and the coating are examined and evaluated to determine the nature of the coating failure.

Dolly Preparation

1. To remove oxidation and contaminants, place the included abrasive pad on a flat surface and rub the base of the dolly across the pad 4-5 times.
2. As required, remove residue left from the abrading process using a dry cloth or paper towel.

Coating Surface Preparation

1. Lightly roughen the coating using the included abrasive pad

Note: As coating abrasion may introduce flaws, it should only be used when necessary to remove surface contaminants, or when the bond strength between the adhesive and the coating is insufficient for pull testing.

2. To promote the bond between the dolly and the coating, degrease the area of the coating to be tested using alcohol or acetone to remove any oil, moisture or dust.

Note: Ensure that any alternative abrasion techniques, **degreasers** or **adhesives** do not alter the properties of the coating. Test by applying a small amount of degreaser or adhesive to a sample area and observing effects.

Adhesive Selection

The adhesive included in the PosiTest Adhesion Tester kit has been chosen as the recommended adhesive due to its versatility. This adhesive has minimal impact on a variety of coatings and a tensile strength exceeding the maximum performance capabilities of the pressure system under ideal conditions. Other adhesives may be preferred based on requirements such as cure time, coating type, working temperature and pull off strength, e.g., quick curing one-part cyanoacrylates (superglues) may be sufficient for painted surfaces, but two-part epoxies are preferred for porous or rough coatings.

Araldite® Adhesive* Preparation

Using a wooden stir stick (included), mix equal parts of the 2011/A and 2011/B adhesive on one of the included cardboard mixing palettes until the compound appears homogenous.

Adhering Dollies to Coating

1. Apply a uniform film of adhesive on the base of the dolly (approximately 2-4 mils thick for best results)
 2. Attach the dolly to the prepared coating test area.
- Note:** If the coated surface to be tested is overhead or vertical, a means to hold the dolly in place during the cure time may be required, i.e. removable tape.
3. Gently push down on the dolly to squeeze out excess adhesive. Do not twist or slide the dolly back and forth on the coating as air bubbles may be generated.
 4. Carefully remove excess adhesive from around the edges of the dolly.
 5. Allow to cure per the adhesive manufacturer's instructions

Note: Many adhesives cure faster and provide a stronger bond when cured with heat. Similarly, cold environments may cause a longer cure time and weaker bond strength.

Final Dolly Preparation

Cutting Instructions:

1. Cut through the coating around the edges of the dolly with the 20 mm cutting tool, removing any excess adhesive.
2. Clear away any debris from the cutting process.

Note: Cutting may induce coating surface flaws such as microcracking that may alter test results.

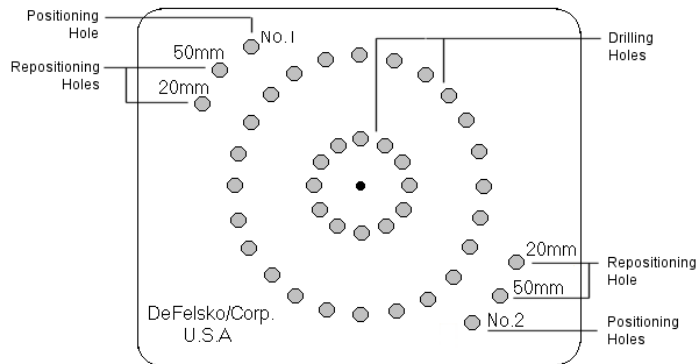
Note: For coatings with strong lateral bonding it is recommended to cut completely through the coating down to the substrate.

Drilling Instructions:

1. Place template on the coating to be tested. With a hand-drill (using a 5/32" / 4.0 mm drill bit) drill the first positioning hole into the coating through the hole marked No.1. While drilling, always hold template firmly against the coating. After drilling, remove the template and remove debris from surface.
2. Reposition the template and insert one of the two attached pins through the template hole marked No.1 and into the first drilled positioning hole.
3. Drill the second positioning hole into the coating through the template hole marked No.2. After drilling, remove the template and remove debris from surface.

- Reposition the template and insert the two attached pins through the template holes marked No.1 and No.2 and into the two drilled positioning holes.
- The template is now positioned to drill either the 20mm or 50mm circle of holes (depending on dolly size) into the coating.
- After all holes have been drilled into the coating for the chosen circle size, remove the template and clean debris from the surface.
- To complete the drilling process and remove all material between existing holes, place the template back onto the surface but rotate so the drilled positioning holes line up with the template repositioning holes labeled 20mm or 50mm, as appropriate. Replace positioning pins and repeat steps 5 & 6.

Note: Make sure all holes for the chosen circle size are drilled completely through the coating to the substrate surface.



Pull Testing

- Ensure the pressure relief valve on the pump is completely open
- Turn the red “drag” indicator on the pressure gauge to zero.

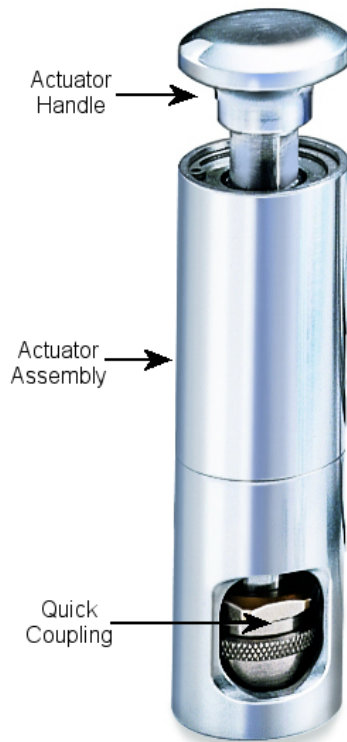
Note: If the black indicator will not return to zero, check to be sure that pressure has been completely relieved from the system.

- Push the actuator handle completely down into the actuator assembly.

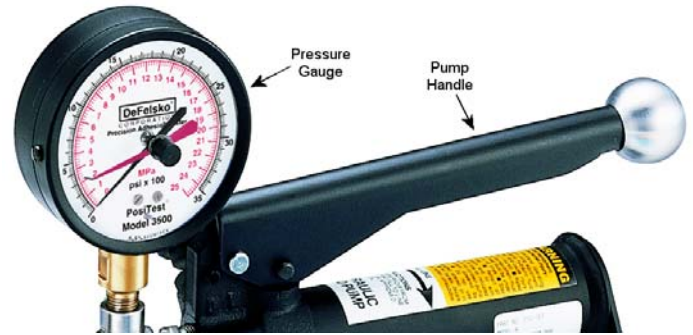
- Place the actuator assembly over the dolly head and attach the quick coupling to the dolly by reaching through the holes in the actuator assembly and lifting the quick coupling. Release the quick coupling when the dolly head is completely engaged.

- Close the pressure relief valve on the pump tightly.**

- Ensure the pump is on a well-supported horizontal surface. If it is necessary to place the pump on a vertical surface, position the unit so the pump hose outlet is in the down position to prevent air from being pumped into the actuator.



- Begin pumping the pump handle until the black indicator on the pressure gauge starts to move. Continue pumping at a uniform rate of no more than **1 MPa (150 psi)** per second until the actuator pulls the dolly from the coating.



- Immediately following the pull, open the pressure relief valve on the pump to release the pressure. The red “drag” indicator on the pressure gauge will maintain the maximum pressure reading.

Note: An imprecise return of the black indicator to zero does not necessarily mean the gauge is out of calibration. If all pressure has been relieved but indicator still does not return to zero, simply tap the gauge on its case with a finger or elevate pressure and release again.

- Record the pull off pressure and mark the dolly for future qualitative analysis.

Analyzing Results

Test results can be considered 100% valid when the coating is completely removed from the substrate and remains adhered to the adhesive on the dolly. When only a portion of the coating is removed, specific results should be analyzed including the fracture pattern to determine the cohesive properties of the coating and adhesion properties between the dolly and adhesive, adhesive and coating, distinct coating layers, and coating and substrate.

Maintenance

Refer to the Pump Operating Instructions (included) for maintenance information.

Warranty

The manufacturer fully warrants its products against defects in workmanship or materials for a period of one year from date of purchase. In the event that a tester is found to be defective, return the product with proof of purchase to your dealer, and the defective product will be repaired or replaced at the manufacturer's option.

No responsibility is assumed for incidental or consequential damages.

The warranty is voided if the tester or its components have been disassembled or tampered with.

Data subject to change without notice



The Measure of Quality

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