



Paul N. Gardner Company

SCRATCH ADHESION MAR (S.A.M.) TESTER **ADHESION**

Instructions for performing scratch,
adhesion, and mar testing with the
SAM Adhesion Tester.



Scratch Adhesion Mar (S.A.M.) Tester

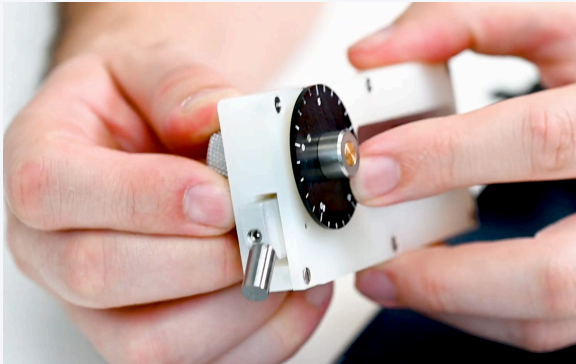


The Scratch Adhesion Mar (S.A.M.) Tester is a portable instrument for evaluating coating scratch resistance, adhesion, and mar resistance in accordance with ASTM D2197. Its adjustable load allows users to determine the minimum force at which a coating shows visible damage.

The SAM Adhesion Tester, is available in a [standard](#) and a [certified](#) version. Both operate the same way. Certified units include traceable calibration documentation for quality records.

Instructions for Use

1. Ensure that the instrument fulcrum is positioned for the required range, either 20 to 250 grams or 200 to 2500 grams, and set the desired loading on the load control dial.
2. Place the test panel on a stable, flat surface. Place the lower edge of the instrument against the test surface with sufficient pressure to ensure uniform contact, and position the stylus or blade at the start of the intended scratch path.
3. While holding the instrument in this position, draw it in a straight line away from the blade at a steady, controlled speed (approximately 0.5 to 1.0 inches per second). Avoid stopping or changing speed during the stroke.
4. Observe the nature of the mark left by the blade or stylus. Use suitable lighting or magnification as needed to see the first signs of visible damage (marring, scratching, or coating removal).
5. If no damage occurs at the initial setting, repeat the test at successively higher loads until the desired degree of coating failure is observed. If the coating fails too easily at the initial load, repeat the test at lower loads to better define the minimum load that produces failure.



Balance Beam Use

1. Prior to the use of the S.A.M. Tester fitted with the Balanced Beam stylus adapter, ensure that the stylus of choice is installed and that the fulcrum is in the correct position for either the high or low range.
2. Set the desired loading on the stylus by loosening the locking nut and rotating the dial to the desired value.
3. Retighten the locking nut, taking care not to change the set reading on the dial.
4. Hold the lower edge of the instrument against the test surface with enough force to overcome the loading on the stylus.
5. Retaining this force, move the instrument along the test surface in the test direction at a rate of 0.5 to 1.0 inches per second.
6. If the coating is not damaged in the initial test, continue testing using successively higher loading on the stylus until the desired degree of coating failure is observed.
7. Both the loop and the needle stylus are produced from 1/16 inch tool steel, heat treated to a hardness of Rockwell C 58 to 60 and then polished. The loop stylus has an outside radius of 0.128 in. The needle stylus has a 1.00 mm diameter tip.

Warning: Do not interchange either the loop or needle stylus between the Balanced Beam Tester (Model 2197A) and the S.A.M. Tester. Overall length of the stylus for the Balanced Beam Tester (Model 2197A) is 1.000 in with an extension beyond the fixture of 0.375 in. Overall length of the stylus for the S.A.M. Tester is 0.440 in with an extension beyond the adapter of 0.190 in.

Crosscut Adhesion Use

1. Prior to use of the S.A.M. Tester fitted with the adhesion cutter attachment, ensure that the cutter of choice is installed and that the fulcrum is in the correct position for either the high or low range.
2. Set the desired loading on the cutter by loosening the locking nut and rotating the dial to the desired value.
3. Retighten the locking nut, taking care not to change the set reading on the dial. Hold the lower edge of the instrument loading handle against the test surface with enough downward force to overcome the loading on the cutter.
4. Retaining this downward force, move the loading handle along the test surface, making a trailing pattern with the cutter.
5. Repeat this cutting motion at 90 degrees to the first cut. (Note that the lower front surface of the instrument is undercut so as not to disturb the surface in the area of the first cut.)
6. Evaluate results obtained as prescribed in ASTM Standard D3359, Method B.

Note: The cutter may be loaded in two different ranges: 20 to 250 grams and 200 to 2500 grams. If operating in the low range, divide the gram force required on the cutter by 10 and set the resultant value on the adjusting knob, which has 25 divisions. If operating in the high range, divide the required load by 100.

It is difficult when using the cutters in the standard handle to obtain uniform loading across the width of the cutter; such uniform loading is required if reproducible results are to be obtained. The reasons are the same as given above for overall loading of the cutter. The adhesion cutter controller ensures uniform loading from side to side of the cutter. The cutter attachment is secured to the lever arm of the controller by a single shoulder bolt and is free to rotate on this bolt; therefore, the cutter is self-aligning on the test surface.

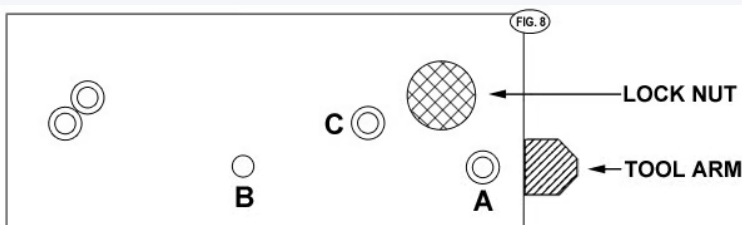
For reproducible results, the face of the cutter must be held at 90 degrees to the test surface during its movement on such surface. An angle greater than this will cause the cutter to ski to the top of the coating, while an angle less than this will cause the cutter to dig deeper.

Important Instructions for Changing Range of Tester

See images below for reference.

1. The tester is set to operate in the high range (200 to 2500 grams).
2. To set the handle to operate in the low range (20 to 250 grams), loosen the lock nut, set the control dial at minimum, and retighten the lock nut.
3. Remove the Allen shoulder bolt from position "C" and place it in opening "B" while moving the cutter arm up and down for an easy fit.
4. Remove the shoulder bolt at position "A" and place it in opening "C".
5. After setting the desired load on the control dial, the handle is ready for use in the low range.
6. Reverse this procedure to restore high-range operation after setting the control dial at minimum.

Caution: Do not remove the other shoulder bolts, as interior components will drop out of place. Do not overtighten the shoulder bolts, as the threads will be stripped from the nylon handle.

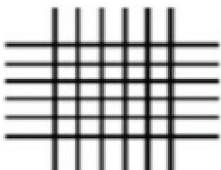
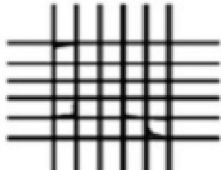
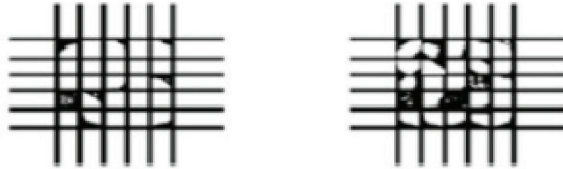
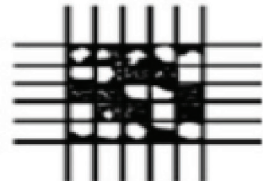


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Classification of Adhesion Test

Refer to the ASTM Standard D3359 adhesion rating chart below to interpret results.

Classification	% Of Area Removed	Surface Of Cross-cut Area From Which Flaking Has Occurred For 6 Parallel Cuts & Adhesion Range By %
5B	0% None	
4B	Less than 5%	
3B	5-15%	
2B	15-35%	
1B	35-65%	
0B	Greater than 65%	

S.A.M. Tester Dial Travel Limit

The dial has a travel-limit pin coming out the back of it that comes in contact with a pin on the body of the tester. With the dial towards you, the dial pin should be on the left of the body pin, and the line on the body should be positioned at the "2" marking on the dial. To increase the load on the stylus, loosen the locking knob on the back of the unit and turn the dial counterclockwise from 2-25, then tighten the locking knob.

If the locking knob is loosened too much, it will allow the dial shaft to feed out until the dial pin can jump to the other side of the body pin so that it is on the right side. Be careful not to turn the dial clockwise an additional revolution, or this will take the load off the spring. If that happens, loosen the knob and turn it back.

