



SURFACE VEHICLE RECOMMENDED PRACTICE

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Methods of Tests for Automotive-Type Sealers, Adhesives, and Deadeners

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Foreword—This Document has not changed other than to put it into the new SAE Technical Standards Board format.

- 1. Scope**—This SAE Recommended Practice contains a series of test methods for use in measuring characteristics of automotive-type sealers, adhesives, and deadeners. The test methods which are contained in this document are as follows:

- ADS-1—Methods of Determining Viscosity
- ADS-2—Low Temperature Tests
- ADS-3—Weld-Through Tests
- ADS-4—Enamel, Lacquer, and Fabric Staining Test
- ADS-5—Wash-Off Resistance Test
- ADS-7—Solids Test
- ADS-8—Flash Point Test
- ADS-9—Sag and Bridging Tests
- ADS-10—Flow Test

The intent of this document is to provide a series of test methods which can be used in testing the various qualities of sealers, adhesives, and deadener material. In later revisions of this document, attempts will be made to reduce the number of tests now presented. The specific temperatures and times at which some of these tests are to be conducted are not dictated in these test procedures, but they will be found in the material standards which govern each type of material to be tested.

2. References

- 2.1 Applicable Publications**—The following publications form a part of this specification to the extent specified herein.

- 2.1.1 ASTM PUBLICATIONS**—Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

- ASTM D 5—Test for Penetration of Bituminous Materials
- ASTM D 93—Standard Method of Test for Flash Point by Pensky-Martin's Closed Tester
- ASTM D 217—Test for Cone Penetration of Lubricating Grease
- ASTM D 553—Standard Method of Test for Viscosity and Total Solids Content of Rubber Cements
- ASTM D 1310—Standard Method of Test for Flash Point of Volatile Flammable Materials by Tag Open Cup Apparatus

ASTM D 1582—Standard Method of Test of Non-Volatile Content of Phenol, Resorcinol and Melamine Adhesives

3. ADS-1—Methods of Determining Viscosity

3.1 Methods of Conditioning Test Materials Prior to Checking Viscosity

3.1.1 FOR VISCOSITY UNAGITATED

3.1.1.1 *Conditioning Method A*—Check the submitted sample as received. Test in the original container or transfer to the test vessel with minimum handling.

3.1.2 FOR VISCOSITY AGITATED

3.1.2.1 *Conditioning Method A*—Material shall be subject to the specified number of cycles in a standard mechanical greaseworker as outlined in ASTM D 217, Test for Cone Penetration of Lubricating Grease.

3.1.2.2 *Conditioning Method B*—Pass the sample once through the sealer cup using specified pressure and orifice.

3.1.2.3 *Conditioning Method C*—Stir a pint sample to 50 stirs with a 1 x 6 in steel-bladed spatula.

3.1.3 FOR VISCOSITY AGED—Conditioning (agitated or unagitated as specified):

- a. Condition the sample in a sealed 1/2 pt can for 72 h in an oven at specified temperature.
- b. Remove from the oven, condition the sample to 77 ± 2 F, and determine viscosity.

3.2 Viscosity Tests

3.2.1 VISCOSITY, PRESSURE FLOW METHOD

3.2.1.1 *Application*—This procedure is used to determine the viscosity of adhesives, sealers, and deadeners. The time required for a specified weight of the material to pass through a specified orifice under a given pressure indicates the viscosity of the material.

3.2.1.2 Equipment Required

3.2.1.2.1 Castor-Severs Rheometer or Pressure Flowmeter—The pressure flowmeter required for this test is detailed in Figure 1. The flowmeter is not available commercially but must be fabricated. For example:

	Sealer Cup Orifices							
	A	B	C	D	E	F	G	H
Diameter of Orifice, in	0.052	0.063	0.073	0.104	0.104	0.125	0.200	0.250
Lengths of Orifice, in	0.531	2.00	0.531	0.531	0.750	2.00	0.750	2.00

3.2.1.2.2 Ring stand and clamps for supporting pressure flowmeter.

3.2.1.2.3 Pressure gage, 100 lb maximum air gage, calibrated in 2 lb increments.

3.2.1.2.4 Pressure relief valve—This is an air cock which opens or closes at a single turn.

3.2.1.2.5 Shutoff valve—Same type as pressure relief valve.

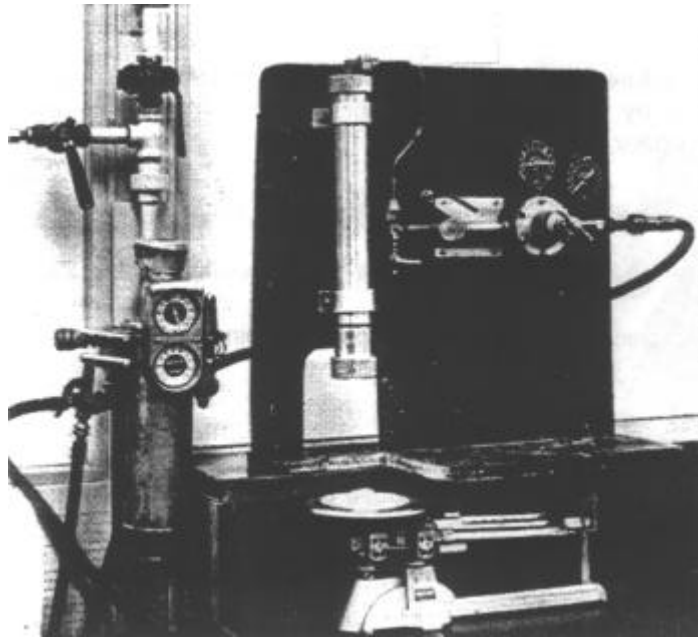


FIGURE 1—CASTOR-SEVERS RHEOMETER OR PRESSURE FLOWMETER (OR KEIL RHEOMETER)

- 3.2.1.2.6 Pressure regulator and extractor—This unit may be of any suitable type which will remove oil and water from the air and which will control the pressure of the air delivered to the pressure flowmeter. The regulator and extractor unit is assembled between the shutoff valve and an adequate air source.
- 3.2.1.2.7 Pipe cleaners suitable for cleaning orifice of flowmeter.
- 3.2.1.2.8 Stopwatch or other timing device calibrated in seconds.
- 3.2.1.2.9 Balance, double beam type or equivalent, sensitivity to 0.01 g.
- 3.2.1.2.10 Connections 0.25 in pipe and fittings with standard pipe threads as are necessary for assembling equipment, as shown in Figure 1.
- 3.2.1.2.11 Mechanical convection oven capable of maintaining a temperature of ± 2 F.

3.2.1.3 *Procedure*

- 3.2.1.3.1 Fill the clean and dry sealer cup equipped with specified orifice with the test material, allowing room for the plunger disc, and assemble the apparatus. Care should be taken to avoid air entrapment.

NOTE—Test material and equipment shall be maintained at a temperature of 77 ± 2 F during the test.

- 3.2.1.3.2 Adjust the air line pressure to the flowmeter as designated by the material standard and bleed until free of air. This should be done while the test material is passing through the pressure flowmeter or Severs Rheometer.
- 3.2.1.3.3 Close air line valve, place a paper on the balance pan under the flowmeter and bring balance to equilibrium. Add specified weight.

- 3.2.1.3.4 Open the air line valve and start the timer when the material touches the paper on the weighing pan.
- 3.2.1.3.5 When the specified weight of the sealer has accumulated on the balance pan, stop the timer, close the air line valve, and open the pressure relief valve.
- 3.2.1.3.6 Report the viscosity of the material as the number of seconds required for a specified amount of the material to pass through the orifice at the specified pressure. (Note: Take the average of three readings.)

3.2.2 BROOKFIELD METHOD

- 3.2.2.1 *Application*—This procedure is to determine the viscosity of adhesives, deadeners, and thin body sealers. The viscosity is indicated by the resistance produced upon a spindle rotating at a definite speed while immersed in the material under test.
- 3.2.2.2 *Equipment*—Commercially available Brookfield Viscometer¹ (Figure 2).

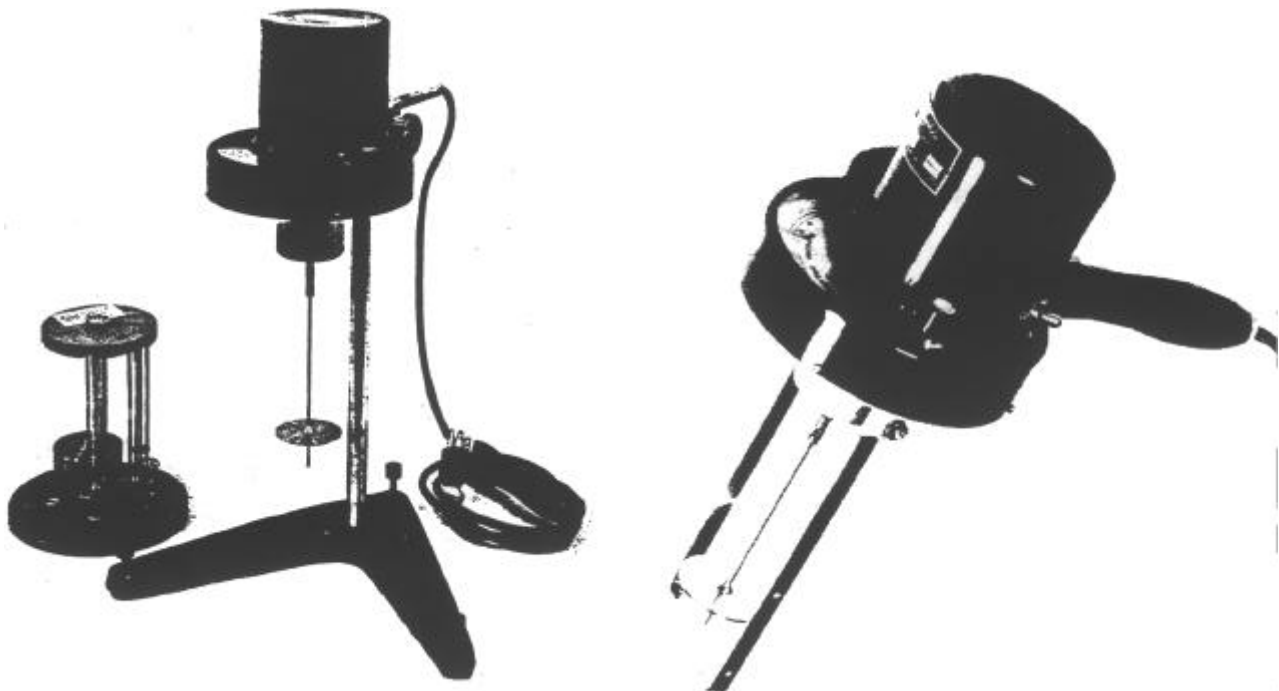


FIGURE 2—BROOKFIELD VISCOMETER

- 3.2.2.3 *Procedure*—Test material and equipment shall be maintained at a temperature of 77 ± 2 F during the test.
 - 3.2.2.3.1 Insert the specified spindle in a pint of test material, keeping the fluid's level below the immersion groove cut in the spindle shaft.
 - 3.2.2.3.2 Attach spindle to the lower shaft.
 - 3.2.2.3.3 Lower viscometer so that the groove cut in spindle shaft is flush with the fluid's level.

1. Available from Brookfield Engineering Laboratories, 240 Cushing St., Stoughton, Mass.

- 3.2.2.3.4 Level the viscometer and set viscometer speed at specified rpm.
- 3.2.2.3.5 Depress the clutch and turn on the viscometer motor. Release clutch and allow dial to rotate for 1 min. Take reading at this position. If the pointer has not stabilized at a fixed position after 1 min, the reading shall not be taken until the pointer has stabilized. The time shall then be recorded.
- 3.2.2.3.6 Using conversion table, convert to centipoise.
- 3.2.2.3.7 When reporting viscosity, the spindle, rpm, and viscometer and model number shall be indicated. Average of three readings.
- 3.2.3 MACMICHAEL METHOD—Used for measuring the viscosity of both Newtonian and non-Newtonian liquids such as sealers, adhesives, and deadeners. The viscosity is given in degrees MacMichael (M).
- 3.2.3.1 *Equipment Required*—A commercially available Fisher-MacMichael Viscometer² with sample cups, plungers, and different gage wires (Figure 3).

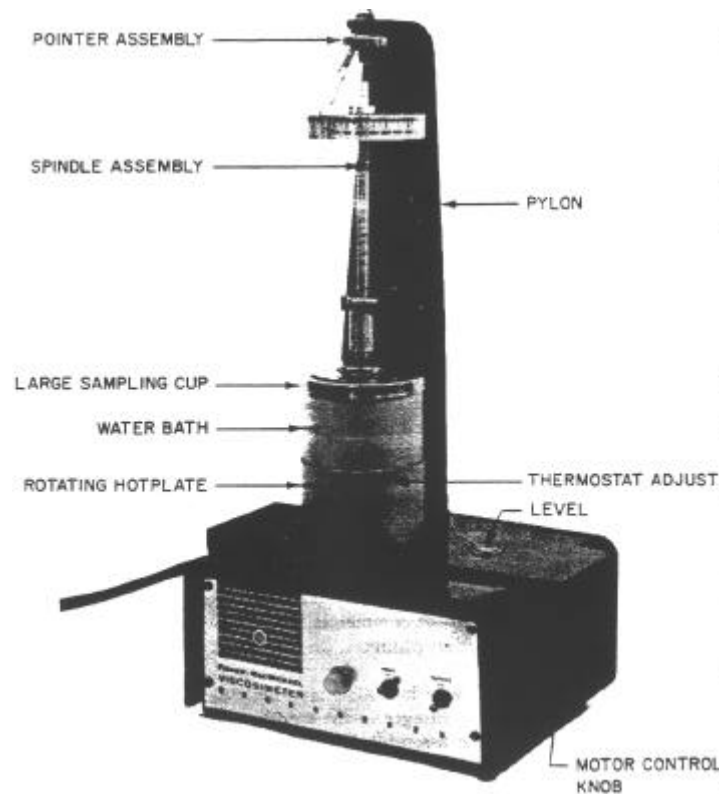


FIGURE 3—FISHER-MACMICHAEL VISCOMETER

2. Available from Fischer Scientific Co., 1458 N. Lamon Ave., Chicago, Illinois 60651.

3.2.3.2 Procedure

- 3.2.3.2.1 Insert specified wire in hollow spindle.
 - 3.2.3.2.2 Attach specified plunger to the spindle.
 - 3.2.3.2.3 Suspend spindle assembly from the pointer assembly support.
 - 3.2.3.2.4 Level apparatus.
 - 3.2.3.2.5 Zero the dial.
 - 3.2.3.2.6 Lift spindle assembly off support.
 - 3.2.3.2.7 Adjust hot plate rotation speed to rotational speed specified.
 - 3.2.3.2.8 Adjust the sample temperature to temperature specified.
 - 3.2.3.2.9 Fill specified clean sample cut (sample depth specified) and place on hot plate.
 - 3.2.3.2.10 If test temperature is greater than 77 F, adjust thermostat to desired temperature.
 - 3.2.3.2.11 Replace spindle.
 - 3.2.3.2.12 Cover sample cup.
 - 3.2.3.2.13 Check that sample is at desired temperature.
 - 3.2.3.2.14 Take reading by turning on the rotate switch and read degrees M from the dial at point spindle becomes stationary or at specified time.
 - 3.2.3.2.15 When reporting degrees M viscosity, the temperature of material, wire gage, plunger, hot plate rotational speed, sample cup size, and sample depth should be indicated.
- 3.2.4 FORD CUP METHOD—Particularly suited for measuring the viscosity of relatively thin adhesives, sealers, and deadeners. The viscosity is given in seconds and is the amount of time it takes for specific amounts of fluid material to pass through a known size orifice.

3.2.4.1 Equipment

- 3.2.4.1.1 Commercially available Ford Cups³ (Figure 4).
- 3.2.4.1.2 Ring stand and ring for holding Ford Cup.
- 3.2.4.1.3 Timing device for measuring seconds.

3.2.4.2 Procedure—Test material and equipment shall be at a temperature of 77 ± 2 F during the test.

- 3.2.4.2.1 Holding finger over aperture, fill the specified clean cup and orifice with the material being tested.
- 3.2.4.2.2 Simultaneously remove finger from aperture and start timing device.

3. Available from Ford Viscosimeter Corp., 7730 W. Fort St., Detroit, Michigan 48209.

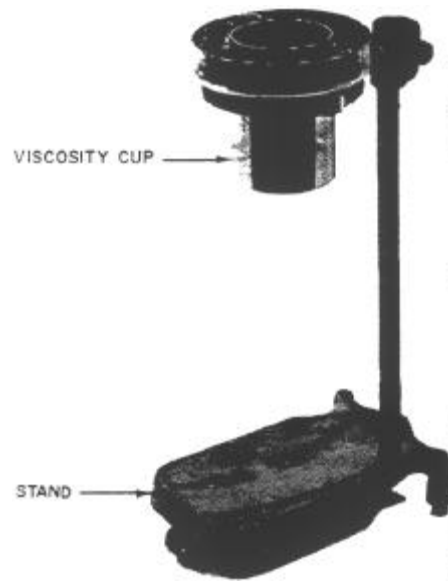


FIGURE 4—FORD CUP

3.2.4.2.3 When a break in the flow of material through the open aperture occurs or a specified amount of material has flowed, stop the timing device.

3.2.4.2.4 When reporting Ford viscosity, indicate the Ford Cup used.

3.2.5 PENETROMETER METHOD—This procedure is used to determine the viscosity of heavy bodied sealers and deadeners. Viscosity is a measure of depth of penetration of a cone or needle into a standard body of material.

3.2.5.1 *Equipment Required*

3.2.5.1.1 Commercially available universal penetrometer as described in ASTM D 217 or ASTM D 5, Test for Penetration of Bituminous Materials. (Figure 5).

3.2.5.1.2 Weights to place on loading bar.

3.2.5.1.3 Penetrating instrument (cone—ASTM D 217, needle—ASTM D 5).

3.2.5.1.4 Stopwatch.

3.2.5.1.5 Sample cup as specified.

3.2.5.2 *Procedure*—Test material and equipment shall be at 77 ± 2 F during the test.

3.2.5.2.1 Level penetrometer.

3.2.5.2.2 Insert specified penetrating instrument into chuck.

3.2.5.2.3 Set dial reading to zero.

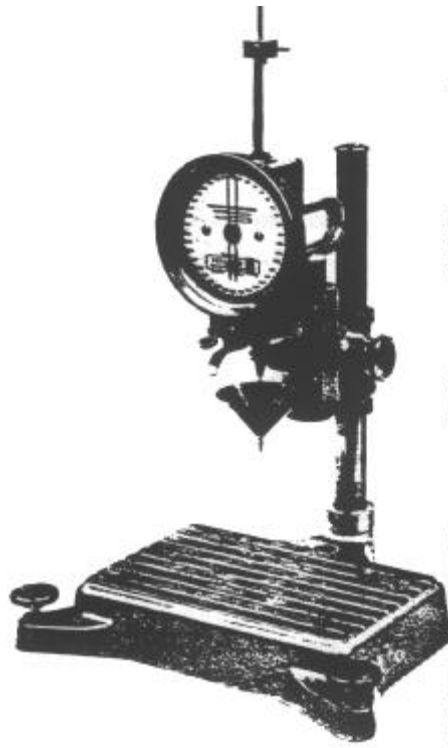


FIGURE 5—PENETROMETER

- 3.2.5.2.4 Add weights as required to loading bar to achieve specified load. (Load is the total weight of rod and penetrating instrument.)
 - 3.2.5.2.5 Fill clean sample cup level full with test material, smooth surface, and place it in position centered under the penetrating instrument.
 - 3.2.5.2.6 Adjust height so as to bring the point of the penetrating instrument exactly into contact with the smooth surface of the sample.
 - 3.2.5.2.7 Release test rod by pushing the clutch trigger down and holding it down during specified time of the test.
 - 3.2.5.2.8 At the end of the specified time, lock the test rod by releasing the clutch trigger.
 - 3.2.5.2.9 Push down the depth gage rod as far as it will go and read the depth of penetration in tenths of millimeters.
 - 3.2.5.2.10 When reporting penetrometer viscosity, indicate the load, penetration time, and cup size (average of three samples).
- 3.2.6 GARDNER MOBILOMETER METHOD—This method is used for determining the viscosity of adhesives and "thin" bodied sealers. Viscosity is expressed as the time in seconds for a standard plunger assembly (disc, piston rod, weight pan), loaded or unloaded, to fall through 10 cm of the test product.

3.2.6.1 Equipment

- 3.2.6.1.1 Commercially available regular Gardner Mobilometer⁴ with 51-hole disc, solid disc, and 4-hole disc (Figure 6).



FIGURE 6—REGULAR GARDNER MOBILOMETER

- 3.2.6.1.2 Weights—Various gram amounts in 50 g increments.
- 3.2.6.1.3 Timing device for measuring seconds.
- 3.2.6.2 *Procedure*—Test material and equipment shall be maintained at a temperature of 77 ± 2 F during the test.
- 3.2.6.2.1 Fill clean cylinder to a depth of 20 cm with material to be tested.
- 3.2.6.2.2 Level instrument.
- 3.2.6.2.3 Attach collar bracket cylinder so top of collar bracket is 4 in down from top of cylinder.
- 3.2.6.2.4 Place piston rod through piston guide and attach specified disc to piston rod.
- 3.2.6.2.5 Lower disc into material until lowest mark on the piston rod is flush with the top of the piston guide. (If there is only two marks on piston rod, lower the piston rod into the material until the bottom mark is 1/2 in above the piston guide top.)

4. Gardner Laboratory, Inc., P.O. Box 5728, Bethesda, Maryland 20014.