

## Description

The Brookfield Dip Viscosity Cup (Zahn Type) is designed to meet the parameters of ASTM D4212. It is constructed of a solvent and corrosion resistant stainless steel and consists of a bullet-shaped cup which can hold up to about 48 ml.

The viscosity range of the cup is determined by a precision-drilled orifice in the bottom of the cup. A 12-inch loop handle allows the cup to be dipped into a liquid container. At the top center of the loop handle is a nameplate. The nominal orifice diameters of the different Dip Viscosity Cups (Zahn Type) are shown below:

$$\begin{aligned} \text{Centistokes} \times \text{Specific Gravity} &= \text{Centipoise} \\ \text{Centistokes} &= K * (\text{efflux time} - C) \end{aligned}$$

Cup No.	Nominal Orifice	Diameter (in.)	Conversion Factors	
			K	C
1		.08	1.1	29
2		.11	3.5	14
3		.15	11.7	7.5
4		.17	14.8	5
5		.21	23	0

## General Information

Dip Viscosity Cups (Zahn Type) are robust instruments which are inexpensive and easy to operate. They may be used anywhere to test the viscosity of a wide variety of fluids in accordance with ASTM Standard Test Methods D816, D1084, or D4212. Ranges of viscosity from about 20 to 1800 centistokes (cSt) for different materials can be evaluated with a set of five different cups as shown in *Table 2*.



Cup No	Viscosity Range (cSt)	Application (material)
1	60 max	very thin liquids
2	20 – 230	thin oils, mixed paints, lacquers
3	150 – 850	medium oils, mixed paints, enamels
4	220 – 1100	viscous liquids and materials
5	460 – 1840	extremely viscous liquids and materials

For very thin liquids with low viscosities up to a maximum of 60 cSt, Cup No. 1 should be used. Cup No. 2 can be used for thin oils, mixed paints, and lacquers (viscosity range: 20 to 230 cSt). Medium oils, mixed paints, and enamels in the 150 to 850 cSt range are best measured with Cup No. 3. Viscous liquids and mixtures between 220 and 1,100 cSt can be measured with Cup No. 4, and extremely viscous liquids and mixtures from 460 to 1,840 cSt are measured with Cup No. 5. Note the overlap in viscosity ranges between different cups. If the expected viscosity range of your application is likely to exceed the range of a given cup, consider the use of a cup with a higher number.

**Example:** Mixed paint, expected range 200-400 cSt, use Cup No. 3 instead of Cup No. 2.

These instruments are designed to comply with the requirements of the following test methods or standards: ASTM D816, ASTM D1084, ASTM D4212.

## Operation

Refer to the ASTM D4212 for a comprehensive procedure. For general purpose, use the following procedure:

1. Choose the proper cup for the expected viscosity of the liquid to be evaluated. The time for the cup to empty should be between 20 and 80 seconds.
2. Immerse the cup and a thermometer in the sample container and stir the sample well to ensure uniform temperature and density. Allow the cup to remain in the fluid for at least 5 minutes to allow the cup temperature to stabilize. Record the temperature.
3. Lift the cup out of the container allowing the cup to hang vertically from your finger by means of the ring.
4. As the top of the cup breaks the surface of the sample, start the timer. Hold the draining cup not more than six inches above the liquid level in the container.
5. Stop the timer at the first definite break in the stream at the base of the cup. The efflux time, or time for the cup to empty, constitutes its viscosity.
6. Report cup number, temperature and time in seconds.
7. Following each determination, clean the cup with a suitable solvent and a soft cloth or soft brush. Use no metal tools to clean the cup as even minor nicks or wear of the precision drilled orifice can result in substantial variations in readings.
8. Fluids can vary dramatically with temperature. It is not unusual even with standard oils to experience changes of 18% per degree centigrade. If it is not practical to control temperature to tight tolerances, the temperature of the fluid must be noted and reported. It is suggested that for each type of material you test, a temperature correction chart should be developed by plotting Zahn seconds at various temperatures and fitting a best fit line to the data points. This diminishes the need to attempt to control temperature yet provides a reasonable method of comparison.

## Ordering Information

The part numbers for the five different Dip Viscosity Cups (Zahn Type) are listed below:

*Table 3*

<b>Cup No.</b>	<b>Part No.</b>	<b>Viscosity Range (cst)</b>
1	BVC-Z1	60 max.
2	BVC-Z2	20 to 230
3	BVC-Z3	150 to 850
4	BVC-Z4	220 to 1100
5	BVC-Z5	460 to 1840



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