

# Viscosity

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## S90 ZAHN Signature Series Dip Cup



All Stainless Steel Calibrated Viscosity Cup



- S90 Zahn Signature Dip Viscosity cups are an improved version of the time honored Zahn Signature viscosity cups. GARDCO is the only producer authorized to use the Zahn name and has added the S90 designation to identify the improved viscosity cups manufactured on new state-of-the-art equipment to insure optimum quality and uniformity.
- Calibration of the S90 Zahn cups match the earlier Zahn Signature cups.
- Conversion formulas and tables relating cup efflux time in seconds to viscosity in centistokes are identical for both series of cups.
- S90 Zahn cups qualify for certification under ANSI/NCSS Z540 or ISO/IEC 17025, ISO 9001, as applicable.
- S90 Zahn cups are calibrated with standard "G" series oils traceable to the National Institute of Standards & Technology.
- "G" series calibration oils are produced in accordance with ISO 9002.
- NOTE: Efflux time from these cups does not meet ASTM specifications. Tables are available for converting S90 Zahn cup efflux time to EZ™ Zahn cup efflux time which complies with ASTM D4212.

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## Features



- Cup flow characteristics are defined by a mathematical formula and standard "G" series oils.
- Furnished with each S90 Zahn cup is a conversion table relating cup efflux time to the nearest tenth of a second to viscosity in centistokes.
- S90 Zahn cups, with the above advantages, cannot be confused with other, lesser defined cups as they are produced, calibrated and sold only by Paul N. Gardner Company and authorized dealers.

# Technical Data



## Range Specification

Item Number	Cup No.	Seconds Range	Centistoke Range
VI-2101	1	31 to 60	15 to 78
VI-2102	2	19 to 60	39 to 238
VI-2103	3	11 to 60	63 to 604
VI-2104	4	10 to 60	97 to 899
VI-2105	5	10 to 60	219 to 1627

Certificate of Calibration available at additional charge for all cups.

## Conversion Formulas

Cup No.	Efflux Time Seconds "T" from Centistokes "V"	Centistokes "V" from Efflux Time in seconds "T"
1	$T = (V + \sqrt{V^2 + 6805}) \div 3.18$	$V = 1.59T - 1070 \div T$
2	$T = (V + \sqrt{V^2 + 12707}) \div 8.36$	$V = 4.18T - 760 \div T$
3	$T = (V + \sqrt{V^2 + 23529}) \div 20.46$	$V = 10.23T - 575 \div T$
4	$T = (V + \sqrt{V^2 + 32983}) \div 30.26$	$V = 15.13T - 545 \div T$
5	$T = (V + \sqrt{V^2 + 58903}) \div 54.54$	$V = 27.27T - 540 \div T$

Note: Furnished with each cup is a conversion table for each tenth of a second within the cup range.

## Standard "G" Series Calibrating Oils

Catalog Number	Oil Number	Use With Cup Number	Nominal Centistokes* at 25°C., 77°F.
VI-3805	G-20	1	35
VI-3815	G-60	2	120
VI-3820	G-100	3	230
VI-3825	G-350	4 and 5	880

\*Certified value is printed on container label. Note: A graph is furnished with each cup showing efflux time of the "G" oil from 20 to 27 degrees Celsius.

These standard oils prepared expressly by the Cannon Instrument Company for the Paul N. Gardner Company are produced in accordance with ISO/IEC 17025:2005, ISO/IEC Guide 34:2009, ISO 9001:2008.

Caution: Silicone fluids should not be used to calibrate viscosity cups. These materials change the interface between the cup surface and the test material and therefore change the cup calibration. The following is taken from ASTM D445: Viscometers used for silicone fluids should be reserved for the exclusive use of such fluids. Solvent washings from these viscometers should not be used for cleaning other viscometers.

## Instructions For Use



1. Select the cup to be used from the Range Specification table.
2. Insure that the cup is clean, especially around the orifice.
3. Adjust temperature of the material to be tested, if necessary.
4. Holding the cup by the ring, immerse it into the test material.
5. Measure and record temperature of material encompassed by cup.
6. Hold cup vertically by inserting index finger into handle ring. In a quick, steady motion, lift the cup out of the sample material, starting the timer when the top edge of the cup breaks the surface. During the flow time, hold the cup no more than 6" above the level of the sample material.
7. Stop the timer when the first definite break in the stream at the base of the cup is observed.
8. Record cup name, number and efflux time in seconds with temperature.
9. Promptly clean the cup taking care not to abrade orifice. Use a length of nylon fishing line to clean the orifice.

## Care of Cup



GARDCO produced and calibrated S90 Zahn viscosity cups are made of stainless steel except for the name plate. These cups will give years of satisfactory service requiring only thorough cleaning following each use. Even so, it is good practice to periodically confirm cup calibration. This is easily done with use of appropriate "G" oil listed in the Calibrating Oils table. Centistoke label value of the oil is traceable to the National Institute of Standards and Technology.

Any remaining material in the cup must be removed by flushing with a suitable solvent. Light naphtha, heptane, octane, highly aromatic solvents, and or any other petroleum-derived hydrocarbon solvent can be used. Varsol® is a commercial solvent that works very well for this purpose.

Completely dry the viscosity cup with a lint free cloth. Use a highly volatile solvent for a second cleaning as since any remaining hydrocarbon solvents from the first process will evaporate quickly after the sample has been flushed from the cup. Hypersolve, MEK and Alcohol can be used in aluminum cups and Hypersolve and Alcohol for the stainless steel cups. Acetone is commonly used as the second solvent because of its high volatility and its ability to dissolve traces of petroleum solvents and water.

In the third process a low velocity stream of clean air will be sufficient to evaporate remaining traces of any volatile solvent. Be aware, avoid rapid evaporation of these solvents as this can cool the surface to such an extent that humid air may be brought below the dew point, causing a film of water to form on the cup.

Varsol is a registered trademark of the Exxon Company

## Notice To All S90 Zahn Viscosity Cup Users



S90 Zahn Signature Series Dip cups do not meet ASTM Specification D4212. Not all S90 Zahn Cups deviate from the standard by the same amount - the range being from near compliance to a variance exceeding a factor of two.

Manufacturing procedures include calibration with oils traceable to the National Institute of Standards and Technology. Certification with compliance to ANSI/NCSL Z540 or ISO/IEC 17025, ISO 9001, as applicable, is available. Tables are available which convert between S90 Zahn Signature and EZ™ cups of the same number, to the nearest tenth of a second, to assist those who need to work with both established standards.