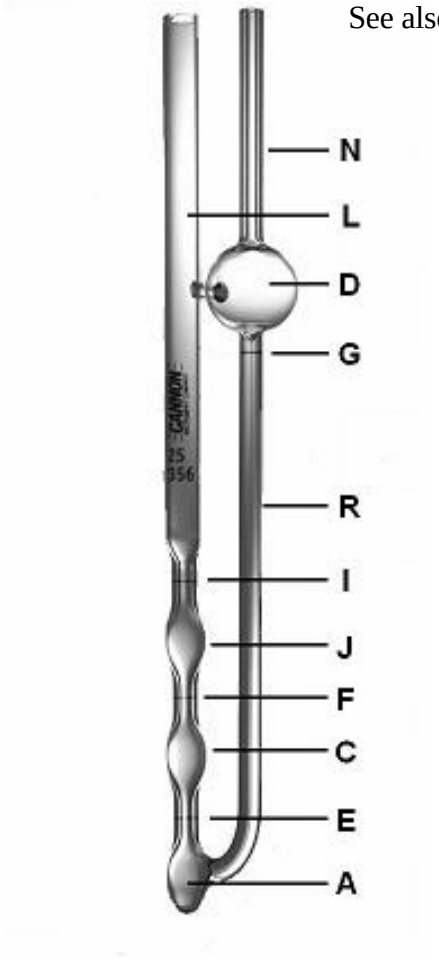
Instructions for the use of
The Cannon-Fenske Opaque (Reverse-Flow) Viscometer

See also ASTM D 445, D 446, D 2170, ISO 3104, and ISO 3105



1. Clean the viscometer using suitable solvents, and dry by passing clean, dry, filtered air through the instrument to remove the final traces of solvents. Periodically, traces of organic deposits should be removed with chromic acid or non-chromium cleaning solution.
2. If there is a possibility of lint, dust, or other solid material in the liquid sample, filter the sample through a fritted glass filter or fine mesh screen.
3. To charge the sample into the viscometer, invert the instrument and apply suction to tube arm L, immersing tube N in the liquid sample, and draw liquid to mark G. Wipe clean arm N, and turn the instrument to its normal vertical position.
4. Place the viscometer into the holder, and insert it into the constant temperature bath. A viscometer holder which fits the Cannon-Fenske Routine viscometer and the Cannon-Manning Semi-Micro viscometer will also fit the Cannon-Fenske Opaque viscometer. Align the viscometer vertically in the bath by means of a small plumb bob in tube L, if a self-aligning holder has not been used.
5. Allow sample to flow through capillary tube R and approximately half-fill bulb A, stopping the meniscus in bulb A by placing a rubber stopper in tube N (you may prefer to stopper tube L for larger size tubes).
6. Allow approximately 10 minutes for the sample to come to bath temperature at 40°C and 15 minutes at 100°C. Make sure the meniscus in bulb A does not reach line E.
7. Remove the rubber stopper and allow the meniscus to travel upwards into bulb C, measuring the efflux time for the meniscus to pass from mark E to mark F.
8. Calculate the kinematic viscosity of the sample by multiplying the efflux time in seconds by the viscometer constant for bulb C.
9. Repeat measurement can be made by evacuating the sample and repeating steps 1 thru 8.

Note: The efflux time for bulb J may be measured and the kinematic viscosity calculated as described above for bulb C. If the two kinematic viscosities so calculated are nearly the same, this is indication that the test sample is Newtonian. If the two kinematic viscosities so calculated vary significantly from each other, the test sample may be non-Newtonian.

Cannon-Fenske (Reverse-Flow) Viscometer for Opaque and Transparent Liquids

RECOMMENDED VISCOSITY RANGES FOR THE CANNON-FENSKE OPAQUE VISCOMETERS

Size	mm^2/s^2, (cSt/s)	Kinematic Viscosity Range mm^2/s, (cSt)		
25	0.002	0.5	to	2
50	0.004	0.8	to	4
75	0.008	1.6	to	8
100	0.015	3	to	15
150	0.035	7	to	35
200	0.1	20	to	100
300	0.25	50	to	250
350	0.5	100	to	500
400	1.2	240	to	1200
450	2.5	500	to	2500
500	8	1600	to	8000
600	20	4000	to	20000
650	45	9000	to	45000
700	100	20000	to	100000

The expanded uncertainty[1] with 95% confidence of the calibration measurements relative to the primary standard is as follows:

Range of Viscosity mm^2/s	Combined Expanded Uncertainty
< 10	0.16%
10 – 100	0.22%
100 – 1000	0.29%
1000 – 10000	0.38%
10000 - 100000	0.44%

The assigned uncertainty of the primary viscosity standard at 20°C is ± 0.17%. See ISO 3666.

[1] An expanded uncertainty U is determined by multiplying the combined standard uncertainty u_c by a coverage factor k: $U = ku_c$, where k = 2. See NIST Technical Note 1297, 1994 edition, *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results.*

THIS PRODUCT WAS CALIBRATED WITHIN A QUALITY SYSTEM WHICH IS REGISTERED TO ISO 9001:2000.