

## Vane Spindles

### Assembly & Operating Instructions

*Vane spindles can be used with any standard Brookfield Viscometer/Rheometer. V-71, V-72, and V-73 are supplied in the Vane Spindle Set (Part No. SSVANE). The V-74 and V-75 spindles are optional extras. The small size of the V-74 vane spindle is ideal for testing small sample sizes and fitting into sample containers with small openings. However, limited surface area for spindle measurement geometry may make it more challenging to obtain repeatable shear stress and viscosity values.*

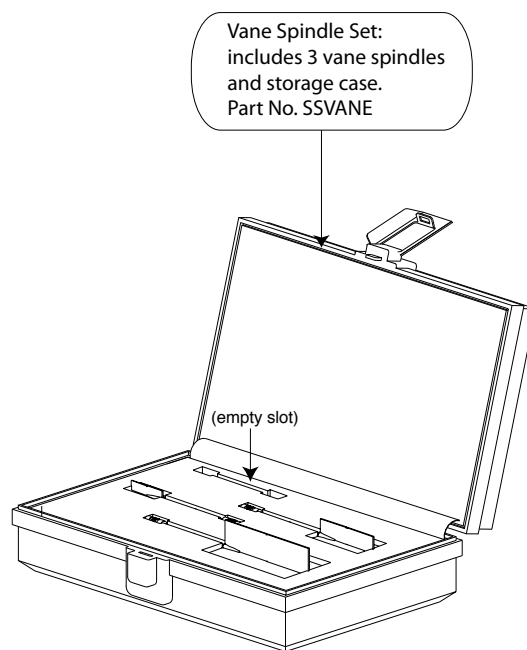
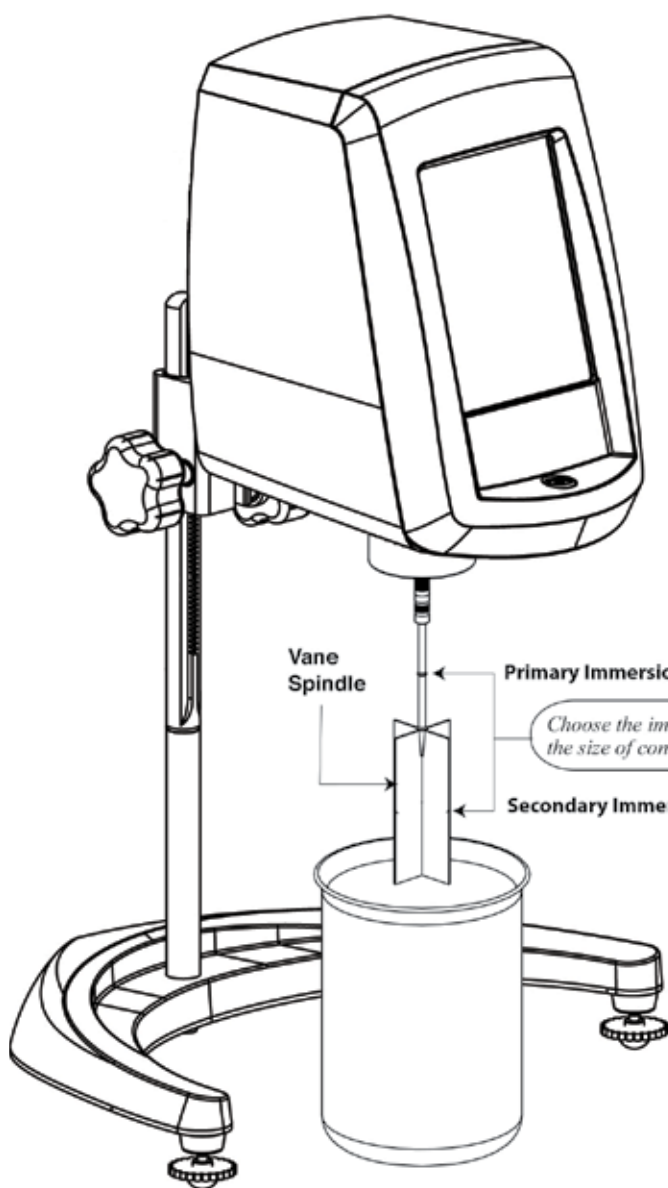


Table 1 - Vane Spindle Dimensions

Spindle	Vane Length		Vane Diameter	
	inches	cm	inches	cm
V-71	2.708	6.878	1.354	3.439
V-72	1.708	4.338	.853	2.167
V-73	.998	2.535	.499	1.267
V-74	.463	1.176	.232	.589
V-75	.632	1.61	.316	.803

Note: Sample container diameter should be at least twice (2x) the vane diameter when possible. Sample container depth should provide clearance, at the bottom, greater than or equal to vane spindle diameter when possible.

## Spindle Range Data

Table 2 - Spindle Data Range

Spindle	Torque Range	Shear Stress Range		Viscosity Range cP		
		Pa	dyne/cm <sup>2</sup>	(mPa•s) @ 10 rpm		
V-71		NOT RECOMMENDED FOR USE ON LV TORQUE				
V-72	LV	.188-1.88	1.88-18.8	104.04	-	1040
V-73	LV	.938-9.38	9.38-93.8	502	-	502000
V-74	LV	9.38-93.8	93.8-938	5.09	-	50900
V-75	LV	3.75-37.5	37.5-375	1996	-	19960
V-71	RV	.5-5	5-50	262	-	2620
V-72	RV	2-20	20-200	1110	-	11100
V-73	RV	10-100	100-1000	5350	-	53500
V-74	RV	100-1000	1000-10000	54300	-	543000
V-75	RV	40-400	400-4000	21300	-	213000
V-71	HA	1-10	10-100	524	-	5240
V-72	HA	4-40	40-400	2220	-	22200
V-73	HA	20-200	200-2000	10700	-	107000
V-74	HA	200-2000	2000-20000	108600	-	1086000
V-75	HA	80-800	800-8000	42600	-	426000
V-71	HB	4-40	40-400	2096	-	20960
V-72	HB	16-160	160-1600	8880	-	88800
V-73	HB	80-800	800-8000	42800	-	428000
V-74	HB	800-8000	8000-80000	434400	-	4344000
V-75	HB	320-3200	3200-32000	170400	-	1704000
V-71	5xHB	20-200	200-2000	10480	-	104800
V-72	5xHB	80-800	800-8000	44400	-	444000
V-73	5xHB	400-4000	4000-40000	214000	-	2140000
V-74	5xHB	4000-40000	40000-400000	2172000	-	21720000
V-75	5xHB	1600-16000	16000-160000	852000	-	8520000

Note: 1) 1 Pa = 10 dyne/cm<sup>2</sup> 2) 1 cP = 1 mPa•s 3) Possibility of turbulence at speeds above 10 rpm may give artificially higher viscosity readings. 4) 5xHB torque is available with the DV-III Ultra/DV3T Rheometers only.

## Viscometer Operation

Lift the coupling when attaching the spindle to avoid damage to the instrument. (Note: spindles have a left-hand thread for installation). Immerse vane spindle down to primary immersion mark on the shaft. Operate viscometer per instructions in the Operator's Manual. Record the instrument Speed (in RPM) and the Torque Reading (as a percent) to the calculated viscosity using the following equation:

$$\text{Viscosity (cP)} = \frac{100}{\text{RPM}} * \text{TK} * \text{SMC} * \text{Torque}$$

where:

- RPM = Viscometer spindle speed in RPM
- TK = Viscometer torque constant from Table 3
- SMC = Spindle multiplier constant from Table 4
- Torque = Viscometer torque (%) expressed as a number between 0 and 100

Table 3 - Viscometer Torque Constants

Model	TK
LV	0.09373
RV	1
HA	2
HB	8
5xHB	40

Digital Viscometer/Rheometer performs this calculation automatically.

If the secondary immersion mark (midpoint on the vane) is chosen due to small container size, multiply the torque reading by a factor of two (2).

$$\text{Viscosity (cP)} = \frac{100}{\text{RPM}} * \text{TK} * \text{SMC} * 2x\text{Torque}$$

Table 4 - Spindle Multiplier Constants and Accuracy

Spindle	SMC	Accuracy*
V-71	2.62	±2%
V-72	11.1	±2%
V-73	53.5	±2%
V-74	543	±5%
V-75	213	±3%

\* Allowable error percentage is calculated on the full scale range viscosity for each spindle at a defined speed.