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Small Sample Adapter
Assembly & Operating Instructions
Manual No. M86-090-J0105

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This instruction sheet applies to Small Sample Adapters with stainless steel chambers (with black water jackets) as well as disposable sample chambers (with gray water jackets). Spindles that can be used with the Small Sample Adapter are identified in Tables 2 and 4.

1. Mount Viscometer securely on stand.

2. Attach locating channel to Viscometer (refer to diagram on page 2) by threading the upper mounting screw into the tapped hole in the Viscometer pivot cup (information on the pivot cup is shown on page 4). **Do not overtighten**. The end of the locating channel with the pin in it must point down.

3. Connect a length of 1/4 or 5/16 inch inside diameter hose from temperature bath circulating pump (outlet) fitting to the lower (inlet) fitting on the water jacket. Connect another length of hose from the upper (outlet) fitting to the bath (inlet) fitting. Hoses should be long enough to allow proper circulation in the water jacket without exerting any "side thrust" on the assembly during operation. Maximum temperature is 100°C; over 60°C use high temperature tubing. For tubing and fluid recommendations, refer to **Table 1**.

4. Attach the water jacket assembly to the locating channel with the lower mounting screw. **Do not overtighten**. The top plate of the water jacket should contact the locating pin in the locating channel. *(For stainless steel chambers: the top of the water jacket may be identified by the metal pin protruding into the chamber sleeve.)*

5. Load the removable sample chamber with the specified amount of sample fluid (see **Table 2**) by leaning the chamber at a 45° angle and pouring the sample fluid slowly down the inside wall of the chamber to avoid air bubble entrapment. **Sample fluid must be bubble-free to ensure an accurate reading. Note:** Immersing the spindle will displace the fluid so take care not to overfill the chamber to avoid spillage of the sample fluid.

6. ***Stainless Steel Sample Chambers:*** Carefully guide sample chamber into water jacket from the bottom until it contacts the metal pin in the jacket top plate. Rotate chamber until the pin engages the slot in the side of the chamber. Raise chamber and rotate counter-clockwise (as viewed from the top) until it stops. Release chamber, allowing it to drop and lock into place.

   Attach connector cable from viscometer head to chamber, if there is an embedded temperature probe in the chamber.

   Disposable Sample Chambers (Part No. SC4-13RD-100): Carefully guide the sample chamber into the water jacket from the bottom until it is inserted high enough to allow closing of the latch at the bottom of the water jacket. Be sure the latch closes completely, engaging the positive snap lock. Rotate the sample chamber until it drops into the locked position where the flat side of the pin at the bottom of the sample chamber engages a flat side of the latch. This prevents the chamber from turning with the spindle during sample measurements. Note: Disposable sample chambers, available in packages of 100 chambers, are replacements for SC4-13R sample chambers only.

7. Assemble the spindle, extension link and coupling nut. Slowly lower spindle into sample fluid. Thread coupling nut (please note that thread is left hand) onto Viscometer spindle coupling. Position insulating cap on sample chamber if desired.

   Note: 1. Spindles SC4-14, 15, 16 and 25 have solid shafts and do not require a coupling nut or link.
   2. Optional #316 stainless steel spindles and chambers are available for acidic or corrosive samples. Contact Brookfield or your local dealer.

8. Level the Viscometer. General operating procedures are described in the Viscometer instruction manual. For Digital Viscometers, refer to manual for spindle entry codes.

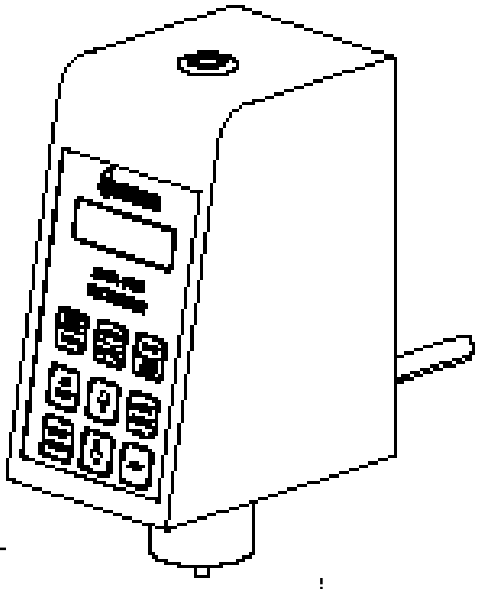
9. Spindle factors for the Small Sample Adapter are shown in **Table 3**. The spindle factor enables the operator using a Dial Reading Viscometer to convert the torque reading to a viscosity reading in centipoise. The spindle factor, when multiplied by 100, defines the maximum viscosity in cP that can be measured.

10. Clean the spindle and chamber using appropriate cleaning solutions.

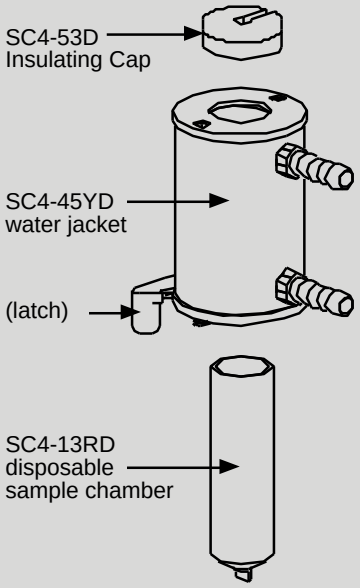
    Note: The black insulating bottom of the sample chamber should not be exposed to strong solvents such as methanol, toluene, ammonia and 111 trichloroethylene. Do not totally immerse the chamber in any cleaning solution. Improper cleaning may result in separation of the black insulation from the chamber.

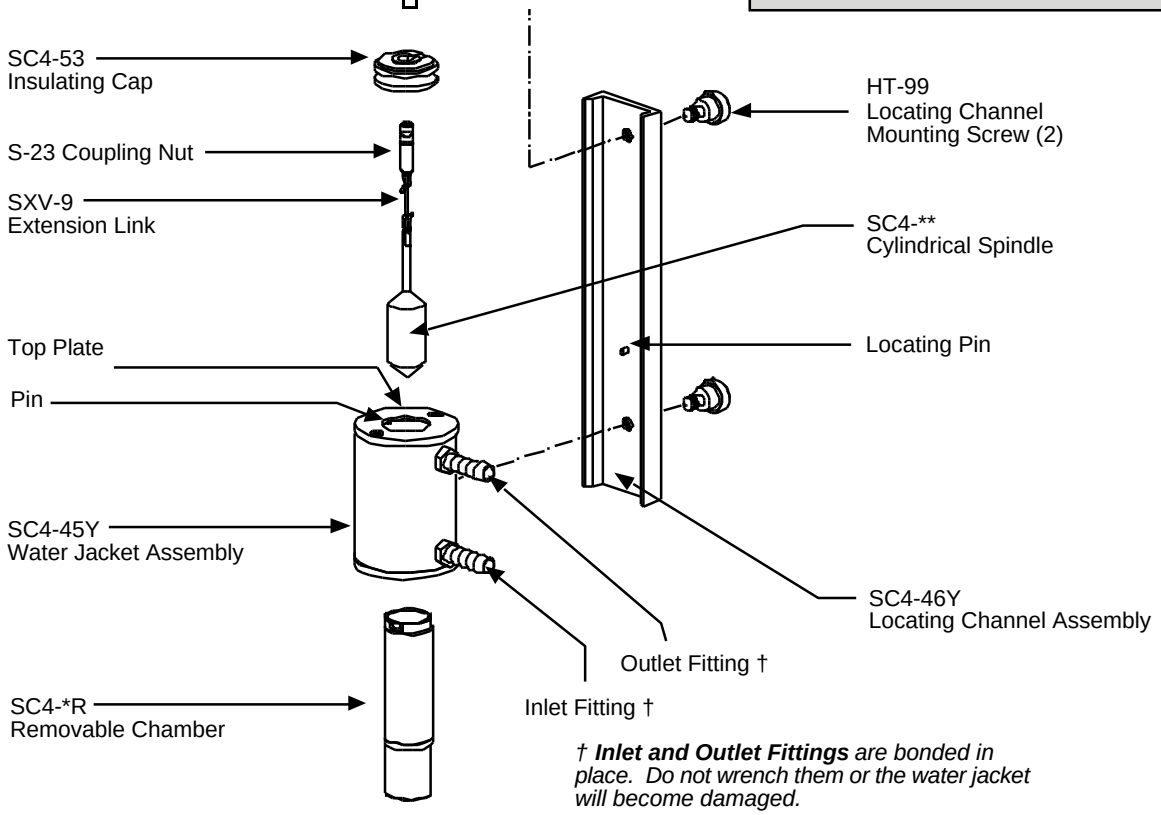
Small Sample Adapter

(shown with DVII+ Pro Viscometer, similar assembly on Dial, DVE, DVI+ and DVIII+/DV-III Ultra Viscometers/Rheometers)

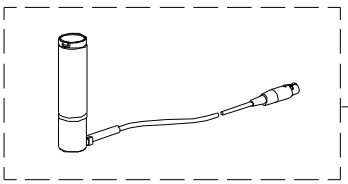


Disposable Sample Chamber





*† **Inlet and Outlet Fittings** are bonded in place. Do not wrench them or the water jacket will become damaged.*



Removable Sample Chamber with embedded RTD Temperature Probe and Connector Cable (Part No. SC4-**RPY)

(Table 1)

Fluid Temperature	Recommended Fluid	Recommended Tubing	Note
-10°C to 15°C	50/50 Ethylene Glycol/Water [1]	Fluran[R, 2] (black) Part No. ULA-45B	**Do Not Use Gum Rubber Tubing With This Fluid**
15°C to 65°C	Water	Gum Rubber (amber) or Fluran[R] (black) Part No. HT-TUBING	
65°C to 100°C	Silicone Oil [3]	Fluran[R] (black) Part No. ULA-45B	**Do Not Use Gum Rubber Tubing With This Fluid**

[R] Fluran is a registered trademark of Norton Co.
[1] Use only laboratory grade ethylene glycol. Do not use automobile anti-freeze which contains materials that can damage the equipment.
[2] Fluran tubing (5/16" ID) and clamps are offered in a kit, Part No. ULA-54A.
[3] Do not use high viscosity oil. Recommend is 50 centipoise.

(Table 2)

Spindle and Chamber	Shear Rate (sec^{-1}) N = RPM	Sample Volume (mL)
SC4-14/6R or/RP	(0.40)N	2.1
SC4-15/7R or/RP	(0.48)N	3.8
SC4-16/8R or/RP	(0.29)N	4.2
SC4-18/13R or/RP	(1.32)N	6.7
SC4-21/13R or/RP	(0.93)N	7.1
SC4-25/13R or/RP	(0.22)N	16.1
SC4-27/13R or/RP	(0.34)N	10.4
SC4-28/13R or/RP	(0.28)N	11.0
SC4-29/13R or/RP	(0.25)N	13.5
SC4-31/13R or/RP	(0.34)N	9.0
SC4-34/13R or/RP	(0.28)N	9.4
SC4-27/13RD	(0.34)N	10.5

(Table 3)

Spindle Factors for Small Sample Adapter
When Used With Dial Reading Viscometer

LV VISCOMETERS

SPEED RPM	SPINDLE NUMBER 18	31	34	16	25
60	0.5	5	10	20	80
30	1	10	20	40	160
12	2.5	25	50	100	400
6	5	50	100	200	800
3	10	100	200	400	1.6K
1.5	20	200	400	800	3.2K
0.6	50	500	1K	2K	8K
0.3	100	1K	2K	4K	16K

RV VISCOMETERS

SPEED RPM	SPINDLE NUMBER 21	27	28	29	14	15
100	5	25	50	100	125	50
50	10	50	100	200	250	100
20	25	125	250	500	625	250
10	50	250	500	1K	1.25K	500
5	100	500	1K	2K	2.5K	1K
4	125	625	1.25K	2.5K	3.125K	1.25K
2.5	200	1K	2K	4K	5K	2K
2	250	1.25K	2.5K	5K	6.25K	2.5K
1	500	2.5K	5K	10K	12.5K	5K
0.5	1K	5K	10K	20K	25K	10K

HA VISCOMETERS

SPEED RPM	SPINDLE NUMBER 21	27	28	29	14	15
100	10	50	100	200	250	100
50	20	100	200	400	500	200
20	50	250	500	1K	1.25K	500
10	100	500	1K	2K	2.5K	1K
5	200	1K	2K	4K	5K	2K
2.5	400	2K	4K	8K	10K	4K
2	500	2.5K	5K	10K	12.5K	5K
1	1K	5K	10K	20K	25K	10K
0.5	2K	10K	20K	40K	50K	20K

HB VISCOMETERS

SPEED RPM	SPINDLE NUMBER 21	27	28	29	14	15
100	40	200	400	800	1K	400
50	80	400	800	1.6K	2K	800
20	200	1K	2K	4K	5K	2K
10	400	2K	4K	8K	10K	4K
5	800	4K	8K	16K	20K	8K
2.5	1.6K	8K	16K	32K	40K	16K
2	2K	10K	20K	40K	50K	20K
1	4K	20K	40K	80K	100K	40K
0.5	8K	40K	80K	160K	200K	80K

K = 1000

To calculate viscosity in centipoise (cP), multiply the dial reading or % torque by the factor corresponding to the viscometer spindle and speed used.

Example: Spindle SC4-34
30 RPM
LV Viscometer
Torque = 75%
Viscosity = 75 x 20 = 1500cP

(Table 4)

DIN* Spindle Ranges for Small Sample Adapter

MODEL	VISCOSITY RANGE (cP)			
	Spindle 82 Minimum - Maximum		Spindle 83 Minimum - Maximum	
LVT	5.7	10,000	18.9	37,898
LVDV-I+/II+	3.4	10,000	11.3	37,898
LVDV-III	1.0	10,000	4.5	50,000
RVT	36.5	10,000	121.3	50,000
RVDV-I+/II+	36.5	10,000	121.3	50,000
RVDV-III	14.6	10,000	48.5	50,000
HAT	73.0	10,000	242.6	50,000
HADV-I+/II+	73.0	10,000	242.6	50,000
HADV-III	29.2	10,000	97.0	50,000
HBT	292.0	10,000	970.4	50,000
HBDV-I+/II+	292.0	10,000	970.4	50,000
HBDV-III	116.8	10,000	388.2	50,000
SMC Codes	3.75		12.13	
SRC Codes	1.29		1.29	
Spindle Entry Code	82		83	
Sample Volume (mL)	5.5		1.5	

*DIN spindles conform to DIN 53019.
The 82 spindle (SC4-DIN-82) works in an SC4-13R or SC4-13RP chamber.
The 83 spindle (SC4-DIN-83) works in an SC4-7R or SC4-7RP chamber.