BROOKFIELD

MODEL VTA120 (Air)

OPERATORS MANUAL

M/97-500

Brookfield Engineering Laboratories, Inc.
11 Commerce Boulevard
Middleboro, MA 02346-1031 USA

Phone: (508) 946-6200 or 800-628-8139 (USA ex MA)
Fax: (508) 946-6262 Internet: http://www.brookfieldengineering.com

BROOKFIELD VISCOSEL
MODEL VTA-120
INSTALLATION
AND
OPERATING INSTRUCTIONS

The VTA-120 viscometer system is a continuous on-line instrument which measures viscosity and adds solvent automatically to maintain a constant ink or coating viscosity. A complete system includes the following parts:

1) VTA-120 Viscometer
2) Universal Mounting Bracket
3) Sample Chamber
4) Air Set (air filter & pressure regulator)
5) Solvent Addition Valve

The system is shipped with the following accessories:

1) 30' 1/4" Tubing
2) 30' 3/8" Tubing
3) 1" Extension link, SXV-08
4) 1 5/8" Extension link, SXV-13

The following options are typical:

5) Pipe-stand mounting
6) Two-gallon plastic solvent supply bottle or safety solvent supply can
7) Adjustable mounting bracket (allowing the complete system to be mounted on a press or coater)

UPON RECEIPT, INSPECT SHIPPING BOXES AND VTA-120 SYSTEM COMPONENTS FOR SHIPPING DAMAGE. REPORT ANY SHIPPING DAMAGE TO THE CARRIER.

Please note that drawings contained in the installation and operation section of this manual are designed to indicate the general arrangement of components, and are not to scale. You will find complete engineering drawings with dimensional information in the appendix.

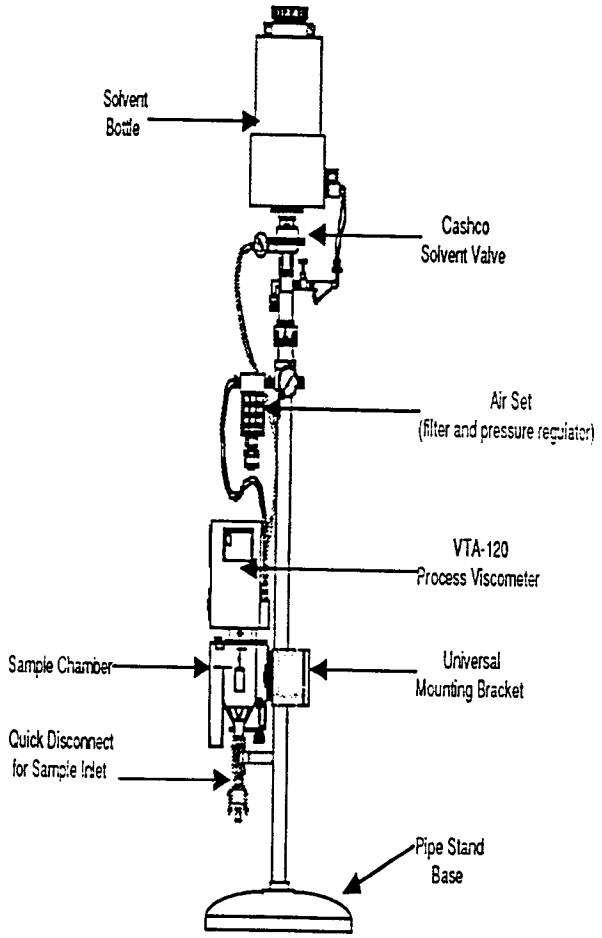


Figure 1: VTA-120 System

UTILITIES:

The system may be completely pneumatic, or may include an electric motor with pneumatic viscosity control circuitry. Utility requirements are:

1) Total Pneumatic System: 3 cfm instrument air per instrument, 20-22 psig, 1/8" NPT female air inlet connection

2) Electric Motor System: 1 cfm instrument air per instrument, 20-22 psig, 3/8" NPT female air inlet connection, 115 or 220 VAC, 50 or 60 HZ, 5 watts

3) Fluid flow to Sample Chamber: 0.25 - 1 GPM flow with VTA107-33Y and VTA107-36Y Sample Chambers.

The following plumbing parts are required for installation:

1) 5/8" Tubing for sample feed to viscometer sample chamber.
2) 1 1/2" Tubing for sample return line to reservoir.
3) 1/4" NPT air line connector for air set inlet (We recommend a quick disconnect type fitting).
4) Adjustable hose clamps for sample feed and return lines.
5) Flow control valve for sample feed line. Brookfield Engineering Laboratories can supply a 3/8" ball valve for this purpose. Contact Brookfield or your Brookfield Representative/Dealer for price and delivery information.

A "pinch valve" may also be used in place of a flow control valve.

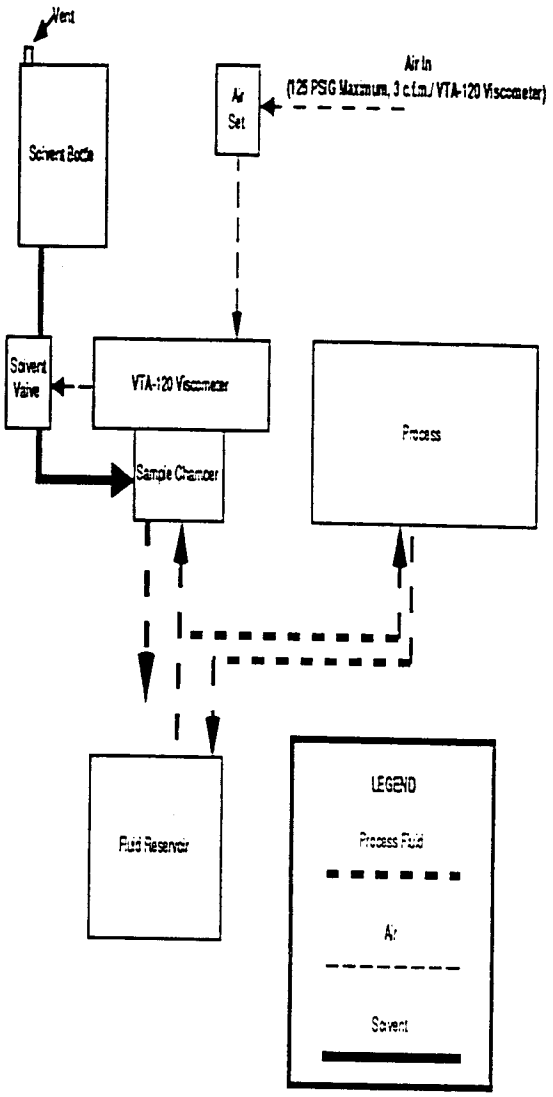


Figure 2: Ink Flow Schematic

SYSTEM OPERATION:

Sample fluid is pumped into the viscometer sample chamber, where a spindle rotates. Size and shape of the spindle used determines range of the instrument. Permanent calibration of the unit is factory set for all standard spindles. The viscometer senses the amount of viscous drag against the spindle and transmits this resistance as a torque signal which is diplayed as a % of spindle range on the VTA-120 2.5" analog readout dial.

Sample fluid returns to the reservoir via the overflow tube, (gravity flow); therefore, the sample chamber overflow must be directed to discharge freely into the reservoir.

When sample fluid viscosity increases beyond its preset control point, the viscometer sends a pneumatic signal to the solvent addition valve. This opens the valve, allowing solvent to flow into the sample cup or fluid reservoir.

TYPICALLY, THE SOLVENT FEED IS PRODUCED BY GRAVITY FLOW. THE SOLVENT SUPPLY MUST BE ELEVATED HIGHER THAN THE SOLVENT VALVE. THE SOLVENT VALVE MUST ALSO BE ELEVATED HIGHER THAN THE FLUID RESERVOIR.

SYSTEM SET-UP:

The VTA-120 installed as a system consists of the viscometer mounted on a universal mounting bracket, a solvent addition valve, an air set (i.e. air pressure regulator and air filter) and solvent bottle. The system is typically mounted on the pipe stand, which is assembled first.

SETTING UP THE PIPE STAND:

The pipe stand has three parts; base (may be portable with castor wheels or round weighted base), pipe support, and a solvent bottle holder.

To assemble, thread the pipe into the base, and then thread the solvent bottle holder onto the top of the pipe.

Remaining components are now assembled and attached to the pipe stand. These components are arranged (on the stand) with the solvent bottle on top, the air set under the solvent bottle, the solvent valve below the air set, and finally the viscometer (which is mounted as a unit on the universal mounting bracket and the sample chamber assemblies).

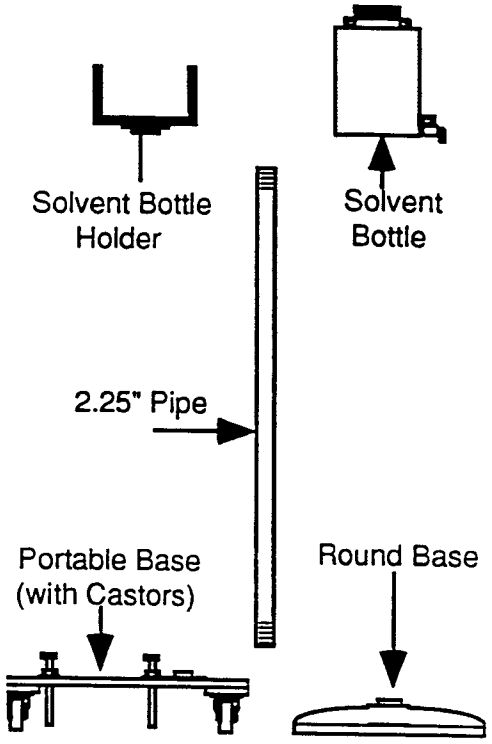


Figure 3: Pipe Stand Parts

VTA-120 VISCOMETER & UNIVERSAL MOUNTING BRACKET (VTA107-62Y):

1) Install 1" extension link onto the eye on viscometer deflector hub as shown in Figure 4 (ref. drawing CE4-005). **THIS PROCEDURE MUST BE ACCOMPLISHED BEFORE PROCEEDING TO ITEM 3 BELOW!!**

2) Install universal mounting bracket to the pipe stand.

3) The VTA-120 is mounted on horizontal surface of the mounting bracket, on the four spacers. Four head screws are then inserted through the bracket and spacers into the bottom of the VTA-120 as shown in Figure 4 (ref. drawing #80-1127).

4) Attach one end of the 1 5/8" extension link to the spindle and attach the other end to the 1" extension link (ref. Item 1 above and Figure 4).

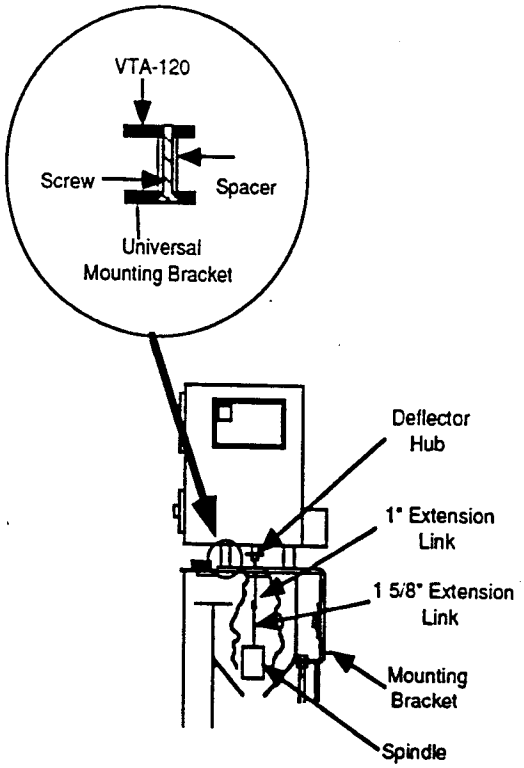


Figure 4: Installing Spacers

INSTALLING THE AIR SET:

1) Attach the air set, using the "U" bolt mounting. The pressure gauge should face away from the VTA-120 Viscometer. See Figure 5 (ref. drawing #CE4-006).

INSTALLING THE SOLVENT (Cashco) VALVE:

1) Attach the solvent valve under the air set, using the "U" bolt mounting. See Figure 6 (ref. drawing #80-0425).

AIR LINE CONNECTIONS:

Air line connections are required between the air set and the VTA-120, and between the VTA-120 and the solvent valve. Two line sizes are used:

Air set to VTA-120: 3/8" o.d. poly flo tubing
VTA-120 to solvent valve: 1/4" o.d. poly flo tubing

Compression fittings (ref. Figure 7) are used to attach the poly flo tube to the appropriate port. System components are shipped with these fittings attached to the ports.

The procedure for connections is:

1) Cut proper length of tubing as required.

2) Remove both compression fittings (i.e. cap and sleeve), and insert the tubing ends.

3) Reattach the compression fitting (with tubing end inserted) into the appropriate ports and tighten.

Refer to Figure 8 for location of the air connection ports.

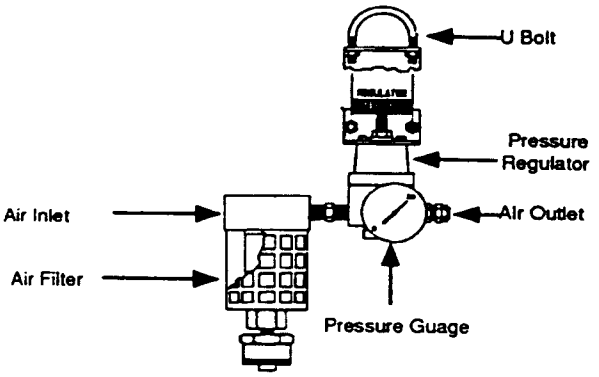


Figure 5: Installing the Air Set

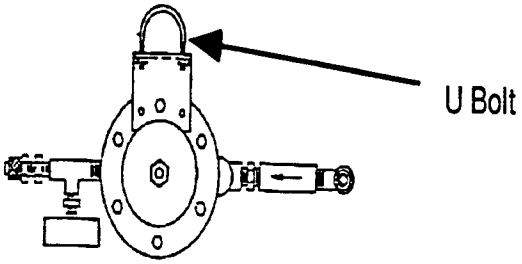


Figure 6: Installing the Solvent Valve

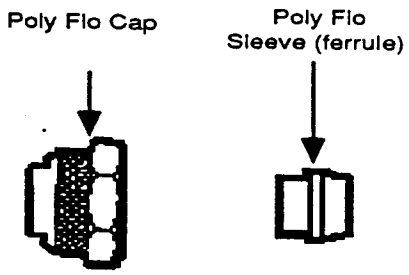


Figure 7: Compression Fittings

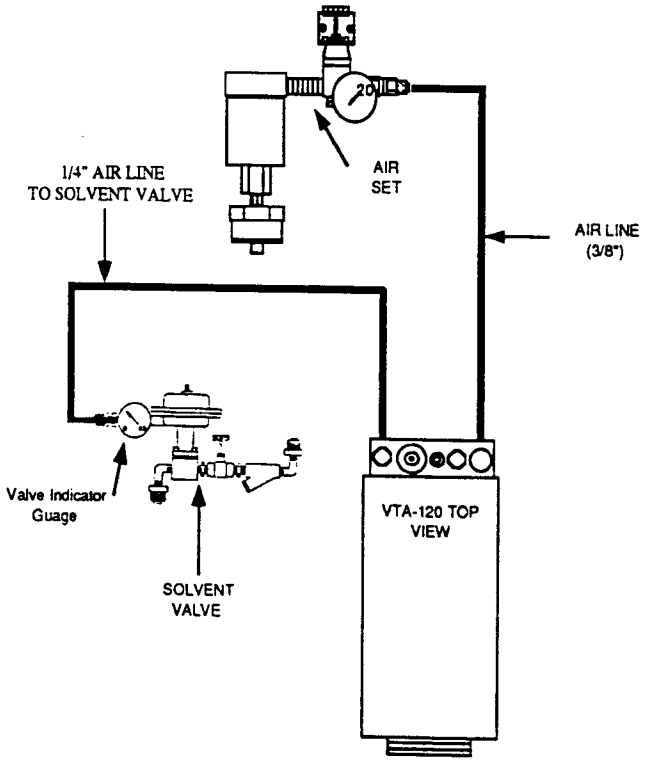


Figure 8: Air Connections

SOLVENT LINE CONNECTIONS:

Solvent lines are installed between the solvent bottle and the solvent valve inlet, the solvent valve outlet and the solvent connection on the universal mounting bracket (3/8" o.d. poly flo tubing is used). Compression fittings are used to attach the tube to the appropriate port. System components are shipped with these fittings attached to the ports. The procedure for connections is:

1) Cut a proper length of tubing.

2) Remove both compression fittings (cap and sleeve), and attach to the tube ends.

3) Reattach the compression fittings (with tubing end inserted) to the appropriate ports, and tighten.

4) Fill solvent bottle with appropriate solvent. Allow the cap to remain loose enough to maintain air vent for proper operation.

5) Open valve fully on solvent bottle.

6) Open solvent line needle valve approx. three full turns for initial operation. The needle valve may be re-adjusted for best control if necessary.

Refer to Figure 9 for location of the connections.

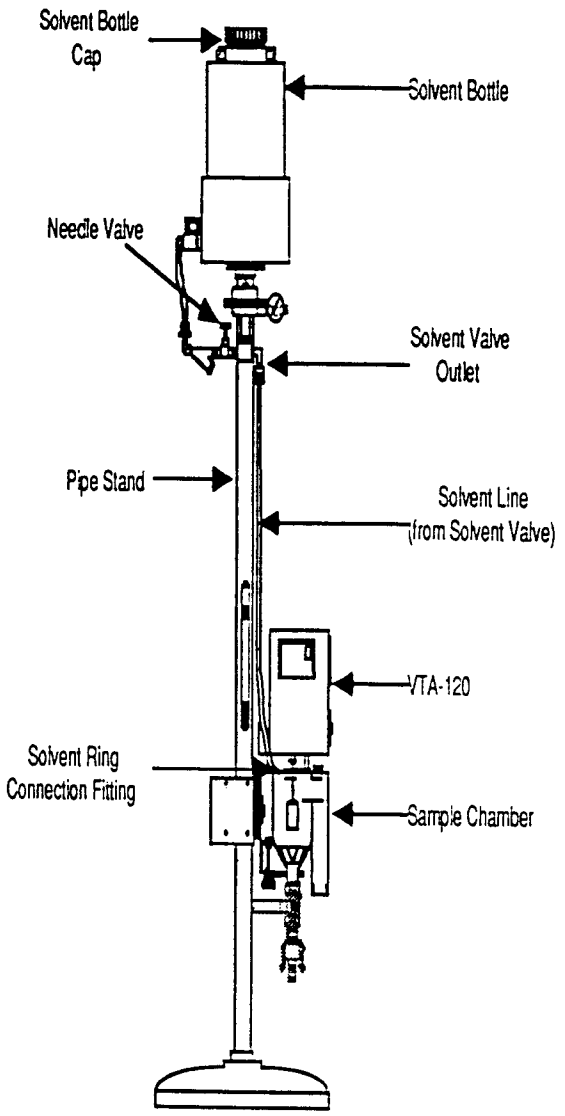


Figure 9: Solvent Connections

SAMPLE SUPPLY FEED AND RETURN LINE CONNECTIONS:

The sample supply flow is shown in Figure 10. Sample fluid is fed to the sample chamber via the 3/8" i.d. inlet on the chamber bottom, and returns to the reservoir via the 1 1/2" i.d. outlet tube. A baffle plug stabilizes the sample fluid flow through the sample chamber.

We suggest that a valve be used between the sample chamber inlet and the pump to regulate flow through the sample chamber. Brookfield offers a brass 3/8" ball valve which may be used for this purpose, or a simple "pinch valve" can be used.

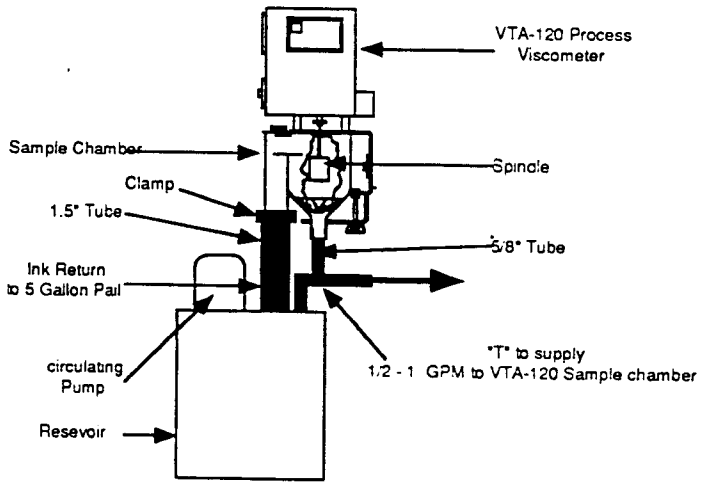


Figure 10: Ink Flow Diagram

Quick disconnect fittings on sample chamber inlet and outlet will simplify system operation. Brookfield offers optional quick disconnects for both inlet and outlet connections.

Normal flow is 0.50 - 1.0 GPM for chambers VTA107-33Y and VTA107-36Y.

VTA-120 SYSTEM OPERATION:

The VTA-120 system is not designed to accomplish blending or "let down" of liquids. *It is designed to maintain the preset* (i.e. press ready) *viscosity.* Therefore; **THE VISCOSITY SHOULD BE PRESET CORRECTLY BEFORE STARTING AUTOMATIC OPERATION.**

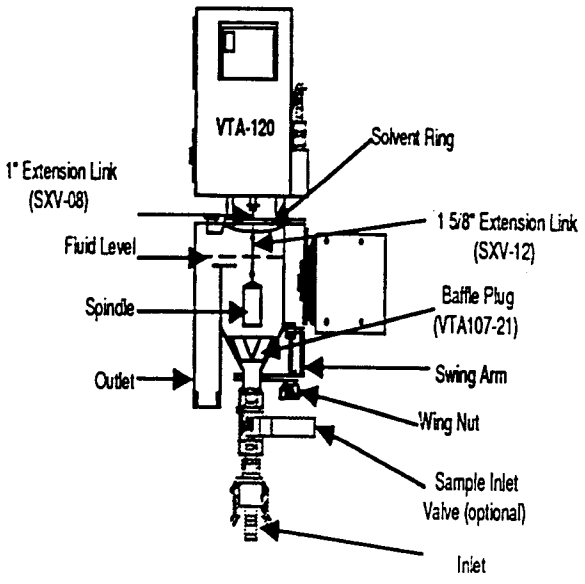


Figure 11: Installing Spindle, Baffle Plug, 1 5/8" Extension Link

1) Install the spindle by attaching one end of the long extension (1 5/8") to the spindle, the other to the end of the short extension (1") which is protruding from the VTA-120 through the center clearance hole in the mounting bracket (ref. Figure 11).

2) Install the sample chamber by placing the upper rim of the chamber against the horizontal surface. The solvent ring will position and help support the chamber. Position the swing arm at the lower end of the mounting bracket under the sample chamber inlet tube and tighten the wing nut (ref. Figure 11).

3) Connect sample feed tube (3/8") to sample chamber inlet.

4) Connect sample return tube (1 1/2") to sample chamber overflow tube. Check that overflow tube is positioned to return sample flow, unrestricted, directly into the reservoir.

5) Close the valve on the sample inlet to prevent a surge flow through the chamber when the ink pump is started.

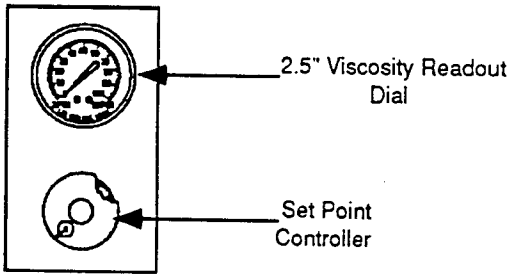


Figure 12: VTA120 Controller Front Panel

6) Start process flow.

7) Slowly open the sample by pass valve (ref. Figure 11) to the sample chamber, observing the level in the chamber. The goal is to avoid "overflow" (i.e. more ink throughput than the chamber will accommodate) of the sample chamber, while providing a continuous representative sample flow (0.5 - 1.0 GPM) through the chamber.

8) Place the set point controller knob (ref. Figure 12) to its maximum "clockwise" position (i.e. manual). This will allow monitoring of the viscosity during the process start up stabilization period.

9) When process stabilization is verified (i.e. viscosity readout on the 2.5" dial indicator does not change; 5-10 minutes after process flow is started), note the displayed viscosity value. The displayed viscosity value is a % of the full scale cP range (e.g. if the full scale range is 200 cP, and the dial reading is 50, the

process fluid viscosity is 100 cP).

10) Reposition the set point controller knob to the exact value being displayed (ref. Item 9 above). The system is now operating in automatic control and solvent will now be added automatically at a rate which compensates for the solvent loss through evaporation.

HELPFUL HINT: When positioning the set point controller knob to the final control value, if possible, observe the indicator gauge on the pneumatic solvent control valve. At the optimum position of the set point controller the solvent control valve indicator gauge will start to respond. At this point, back off the set point controller knob ever so slightly to allow a positive 1-2 psig reading on the valve indicator gauge. DO NOT EXCEED THIS OUTPUT VALUE! Solvent will start to flow at approx. 6-8 psig (factory set) output reading. The viscometer set point is now "fine-tuned" to maintain the required viscosity value.

VISCOSEL START UP PROCEDURE

AFTER INITIAL CHECKS AND INSTALLATION OF THE VTA-120 ARE COMPLETE, THE FOLLOWING START-UP PROCEDURES SHOULD BE EMPLOYED:

1) Move the set point controller dial clockwise to its maximum position (100 or higher).

2) Adjust and maintain the instrument air supply to 20 psig by adjusting the air regulator supplied with the air set (re. figure 13). Open the slide valve which is located at the back of the Viscosel base as shown in figure 14. Some units are equipped with electrical drive and control necessitating the energizing of 115 volt AC power circuits.

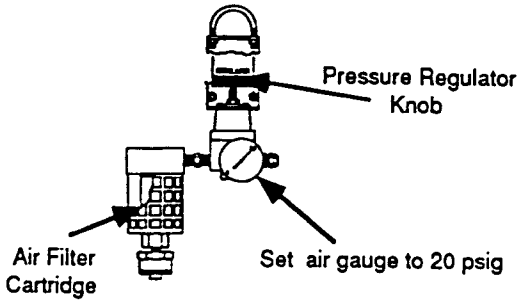


Figure 13: Air Set

3) Perform the following three checks to determine Viscosel operating condition (re. figure 15):

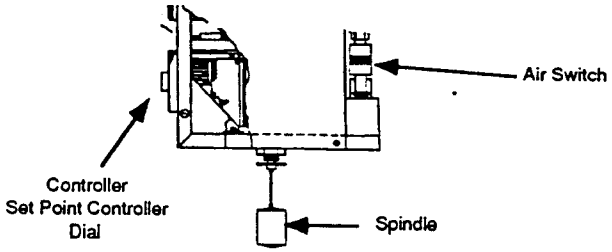


Figure 14: Viscosel Air Switch

   a) Observe that with power supplied to Viscosel (air and/or electric) and with the Viscosel leveled, the analog dial indicator is reading zero with the spindle rotating in air.

   b) Apply a momentary drag to the rotating spindle, all other conditions being the same as check a). The analog dial indicator should respond with an up-scale swing. As soon as the drag is removed, the analog dial indicator should return to zero. The return to zero may be smooth, or may be accompanied by decaying oscillation because of the characteristics of the calibration spring and the inertia of the spindle.

   c) Stall the spindle and the analog dial indicator should respond with a full scale reading. The Viscosel can not be damaged by stopping the spindle as a friction clutch within the instrument protects the measuring system against over loading.

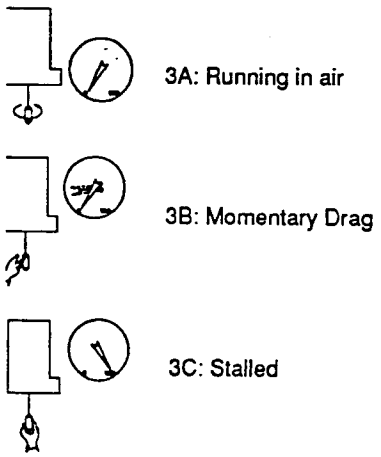


figure 15: Three Point Test

   If the instrument performs these three checks, the viscosity measuring part of the system is in good operating condition.

4) Start process flow, and manually adjust the flow through the sample chamber to 0.5 to 1.0 GPM.

5) Wait for process conditions to stabilize.

6) Once process is stabilized, adjust set point controller dial so that its reading is identical to the value displayed on the analog dial indicator . Any set point over 10 and below 90 is acceptable for good operation. If the value displayed on the analog dial indicator is consistently outside this range, a spindle range change may be required. The Viscosel will now operate automatically by providing solvent whenever the value of the analog dial indicator exceeds that of the controller set point dial. The indicating guage on the pneumatic solvent supply (re. figure 16) valve will indicate solvent addition. Solvent flow will typically occur above 8 psi, and will stop at readings below 6 psi.

CAUTION: DO NOT ADJUST THE PNEUMATIC SOLVENT ADDITION VALVE: ITS ON/OFF CONTROL CHARACTERISTICS ARE FACTORY SET AND MAY NOT BE CHANGED!

7) If analog dial indicator readout is consistently higher than set point (not enough dilution) open the solvent needle valve (re. figure 16) slightly to increase solvent flow, and reduce lag time. If analog dial indicator readout is consistently lower than the set point (excess dilution), close the solvent needle valve ***slightly*** to reduce solvent flow.

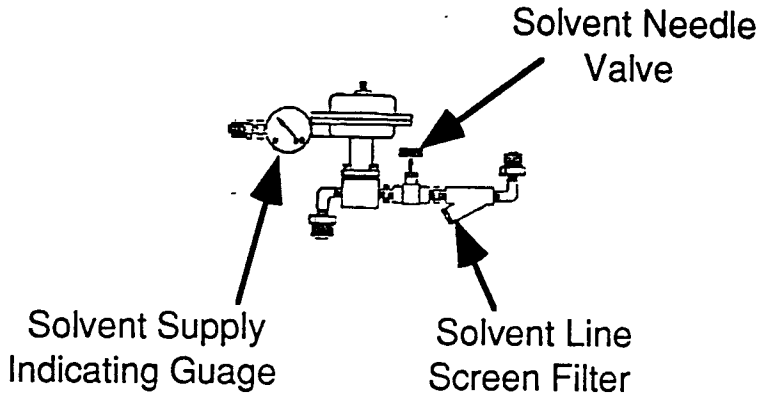
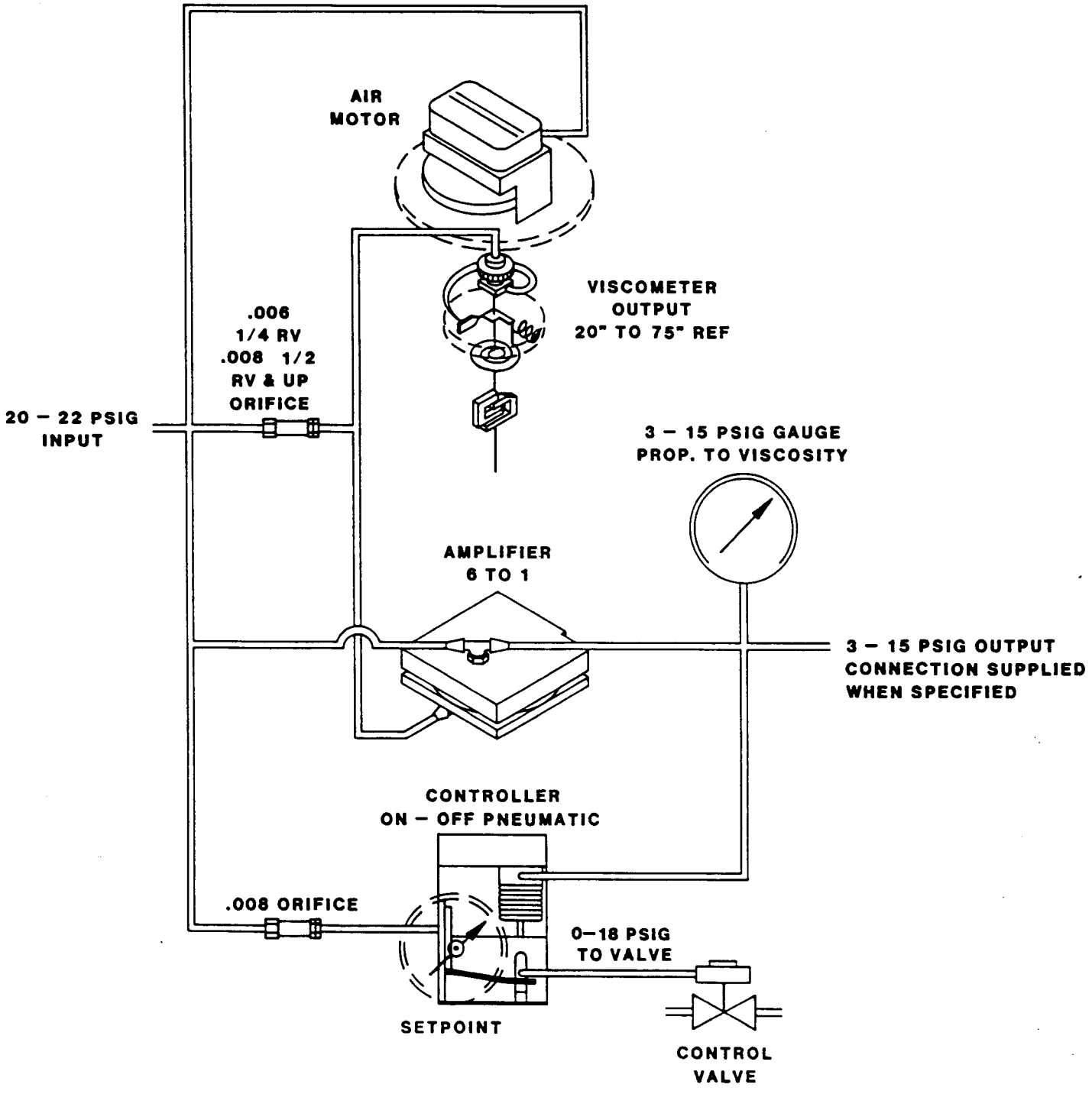


Figure 16: Solvent Valve Indicator Guage

NOTE: TO INSURE CONTINUED GOOD OPERATION, AND A CLEAN AIR SUPPLY REPLACE AIR FILTER CARTRIDGE (re. figure 13) OF AIR SET SUPPLY ON A REGULAR BASIS (90 DAY CYCLE OR LESS). IT IS ALSO RECOMMENDED THAT THE SOLVENT LINE SCREEN FILTER BE PERIODICALLY CLEANED AND REPLACED.

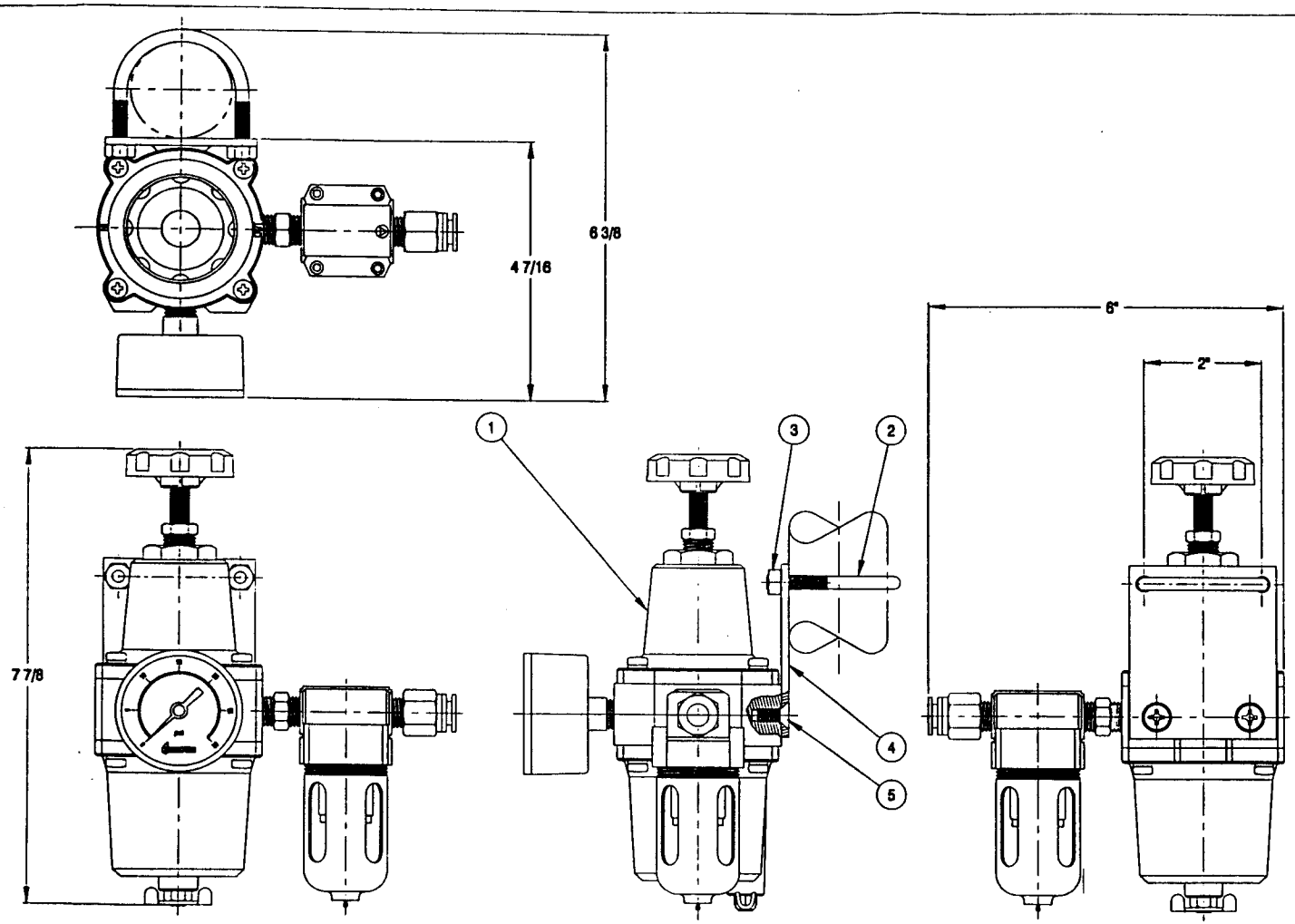
BROOKFIELD ENGINEERING LABORATORIES, INC.

VTA 120
PNEUMATIC SYSTEMS
AIR CIRCUIT DIAGRAM



78–0424
REV. 10/22/86

No	Revisions	Dr by	Date	Ch. by



ITEM	PART #	DESCRIPTION	QTY.
1	VTA 106-183Y	AIR SET ASSEMBLY (PURCHASED)	1
2	SB-15	U-BOLT	1
3	50N252007E010	1/4-20 18-8 S.S. HEX NUT	2
4	VTA 106-178	BRACKET, FILTER REGULATOR	1
5	VTA 106-184	SCREW, METRIC, M6 X 10MM, PHILLIPS FLAT HD.	2

ALL DIMENSIONS ARE IN INCHES
Tolerances
(unless otherwise specified)
Fractions ± .010 Angles ± 1/2°
.XXX ± .003
.XXXX ± .0005
63

DO NOT SCALE DRAWING!

Material: AS NOTED

Scale: NONE | Finish: NONE

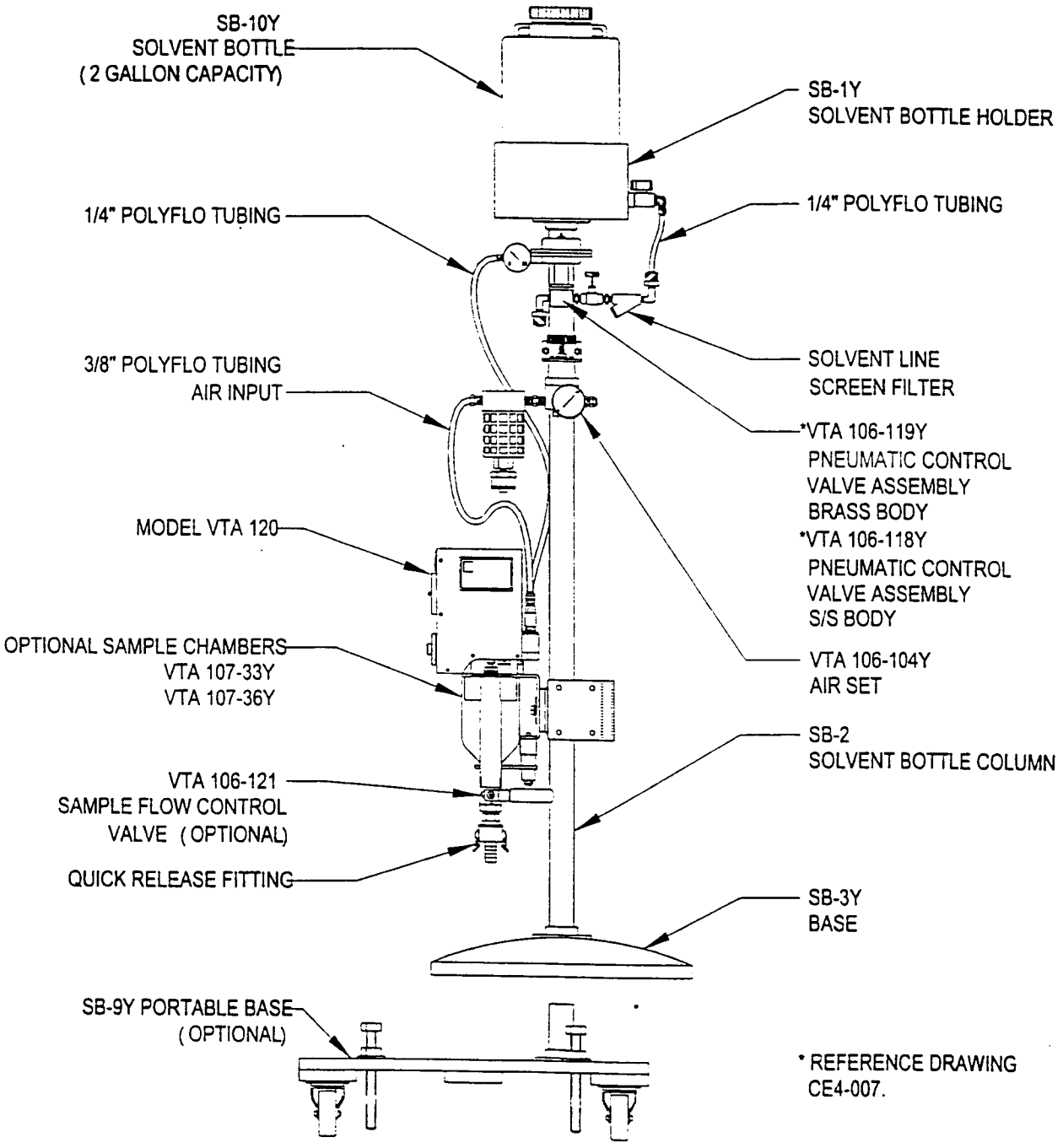
Dr by: KFM | Date: 4/18/97 | Ch. by:

BROOKFIELD

Title: AIR SET ASSEMBLY

Dwg No: VTA 106-104AY

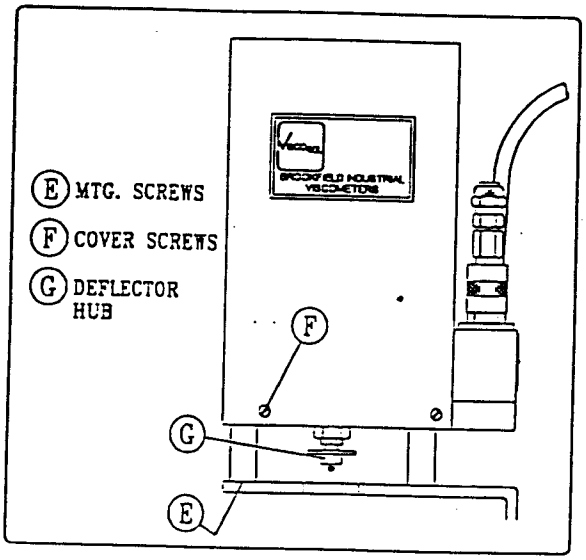
BROOKFIELD	TITLE	DOCUMENT NO. CE4-001
CREATED BY JRD	SOLVENT BOTTLE STAND MODEL VTA 120/VTA 107 SAMPLE CHAMBERS	PAGE NO. 1 OF 1
APPROVED BY HWC		REV. NO. 2 / DATE 8/6/02 / CHK. BY
DATE 6/6/92		

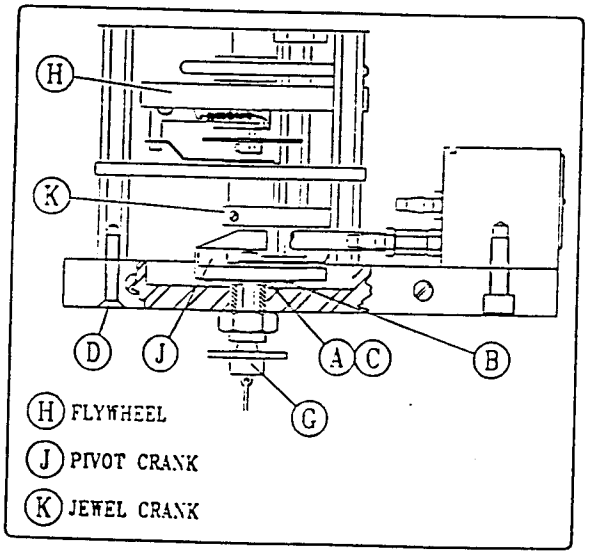


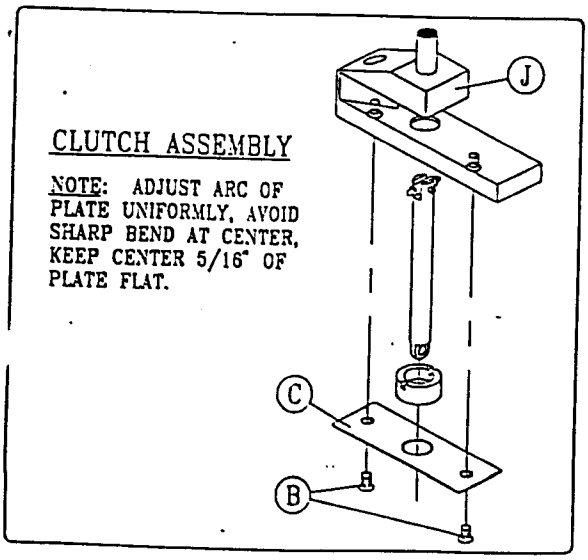
* REFERENCE DRAWING CE4-007.

NOTE: SOLVENT BOTTLE IS NOT FOR USE WITH VOLATILE SOLVENTS.

BROOKFIELD	TITLE	DOCUMENT NO.
CREATED BY KFM	VISCOSEL CLUTCH ADJUSTMENT PROCEDURE	CE4-014
ED BY HWC		PAGE NO. 1 OF 1
TE 9/19/91		REV. NO. 1 / DATE 4/16/93 / CHK. BY







1. IMPROPER ADJUSTMENT OF THE CLUTCH CAN BE EVIDENCED BY AN OSCILLATING INDICATION AT THE RECORDER/INDICATOR, OR INABILITY TO ACHIEVE READINGS AS HIGH AS PROCESS CONDITIONS SHOULD INDICATE.

2. TO MAKE CLUTCH ADJUSTMENTS ON PROCESS MOUNTED INSTRUMENTS, IT IS RECOMMENDED THAT THE VISCOMETER HEAD BE SEPARATED FROM THE MOUNTING HARDWARE AND REMOVED TO AN AREA SUITABLY EQUIPPED FOR INSTRUMENT REPAIR. TO SEPARATE HEAD, DISCONNECT POWER AND SENSING LINES, REMOVE SPINDLE AND EXTENSIONS, AND UNSCREW FOUR MOUNTING SCREWS "E".

3. REMOVE COVER SCREWS "F" USING 3/16" HEX SCREWDRIVER.

4. IF PRECISE DIFFICULTY WITH THE CLUTCH IS NOT KNOWN, SET HEAD IN NORMAL OPERATION POSITION, SUPPLY POWER, HOLD DEFLECTOR HUB "G", VTA 100-8B, TO PREVENT ROTATION. DO NOT PULL DOWN OR LIFT UP HUB. MOTOR SHOULD BE ABLE TO CONTINUE TURNING FLYWHEEL "H", AND PIVOT CRANK "J" SHOULD MAINTAIN STEADY CONTACT WITH JEWEL CRANK "K". IF SENSING CIRCUIT COULD BE CONNECTED DURING THIS TEST, THE RECORDER SHOULD INDICATE A STEADY 100% OF SCALE READING (REF. CE4-009).

5. IF CLUTCH STALLS MOTOR, APPLY A SMALL AMOUNT OF THIN OIL WITH A TOOTHPICK INTO GAP "A".

6. IF MOTOR CONTINUES TO STALL , REMOVE DEFLECTOR HUB "G", VTA 100-8B, USING NO. 4 SPLINE SCREWDRIVER. ALSO REMOVE THREE SCREWS "D" AND TILT FRAME "L" TO RIGHT. REMOVE TWO SCREWS "B" RELEASING PLATE "C". REDUCE PRELOAD ARC OF PLATE "C", REINSTALL. TEST. IF INSTUMENT SATISFIES STEP 4 ABOVE SEAL SCREWS SECURELY WITH DUCO CEMENT. REINSTALL OTHER PARTS.

7. IF CLUTCH SLIPS, RELEASE PLATE "C" AS DESCRIBED IN STEP 6. INCREASE PRELOAD ARC. REINSTALL. TEST. WHEN SATISFACTORY, SEAL SCREWS "B" WITH DUCO CEMENT. REASSEMBLE UNIT.

BROOKFIELD ENGINEERING LABORATORIES, INC.

OPERATING PROCEDURE FOR BROOKFIELD VISCOSEL WITH SAMPLE CHAMBER

Before attempting to use the Viscosel, the instrument must be level. The instrument is equipped with a spirit level located on its base, and the actual leveling of the Viscometer can be accomplished by adjusting the ball socket joint which is part of the instrument and sample chamber mounting bracket (ref. dwgs. and 85-0819).

When a sample chamber is supplied it is usually for installation in a side stream to the main ink line to the press. The sample chamber has a design maximum flow rate of 2 gpm. A minimum flow of gpm is satisfactory. After the ink viscosity has been measured, the ink flows by gravity to the ink reservoir or sump. It is very important that the sample be continuous. If the ink does not flow through the chamber, the Viscometer will be looking at a stagnant sample while adding solvent to the ink sump. This will cause washout or overdilution of the ink. It is good practice to check the sample flow by observing the ink as it returns to the reservoir from the sample chamber.

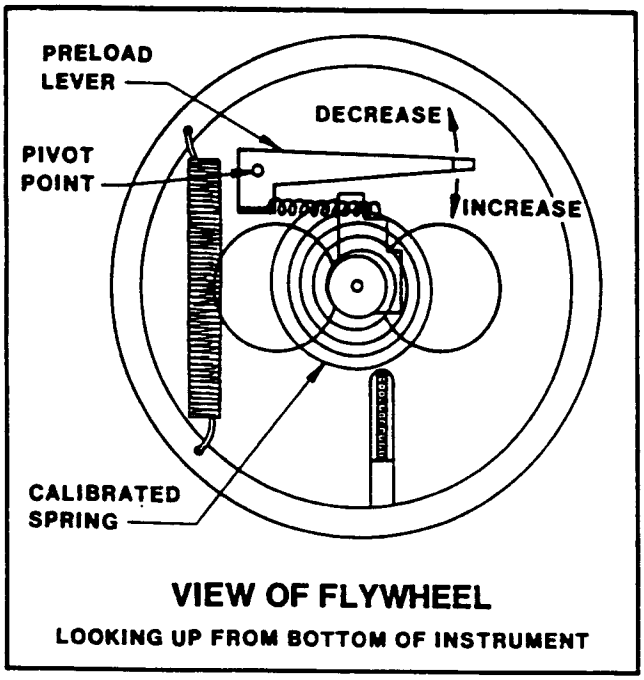
It is also important that the Viscometer spindle (rotating member) be located in the middle of the chamber half way between the chamber exit or overflow and the baffle located in the chamber bottom. Location of the spindle is controlled by the spindle extension wires supplied with the instrument. With 1" Viscometer mounting spacers and a hollow cylindrical or closed conical spindle, a 1" extension together with a 1 5/8" extension is used. The 1" extension is mounted on the Viscometer base before the instrument is secured to its universal mounting bracket. Size of the spindle determines instrument range - larger spindles are used on thinner inks (ref. dwg. Spindles must be kept clean as buildup will cause a change in calibration or false high reading.

The sample chamber and baffle located in the chamber bottom must also be kept clean. This will avoid plugging of the chamber and malfunctioning of the instrument caused by the spindle coming in contact with ink that has skimmed over at the overflow or that has built up on the baffle. To alleviate this problem standard viscosity control systems are equipped with hardware to introduce solvent at the top of the chamber. The VTA107-43 solvent ring allows solvent to be added at the air/ink interface preventing skimming and improving mixing action of the solvent with the controlled fluid as it returns to the reservoir.

The input line to the chamber must be at least 3/8" inside diameter, and a good sample control valve used. A ball valve is recommended. If the sample rate through the chamber is difficult to maintain because of changes in pumping rate to the press, it may well be that a new impeller or pump bearings are required to improve efficiency of the pumping system.

BROOKFIELD ENGINEERING LABORATORIES. INC.

PNEUMATIC TRANSMITTER ZERO ADJUSTMENT



VIEW OF FLYWHEEL

LOOKING UP FROM BOTTOM OF INSTRUMENT

CAUTION: A SMALL MOVEMENT OF THE PRELOAD LEVER WILL CAUSE A RELATIVELY LARGE MOVEMENT OF THE ZERO READING.

DO NOT TOUCH THE PRELOAD LEVER OR ANY PART OF THE INTERNAL ASSEMBLY WHILE THE INSTRUMENT IS RUNNING.

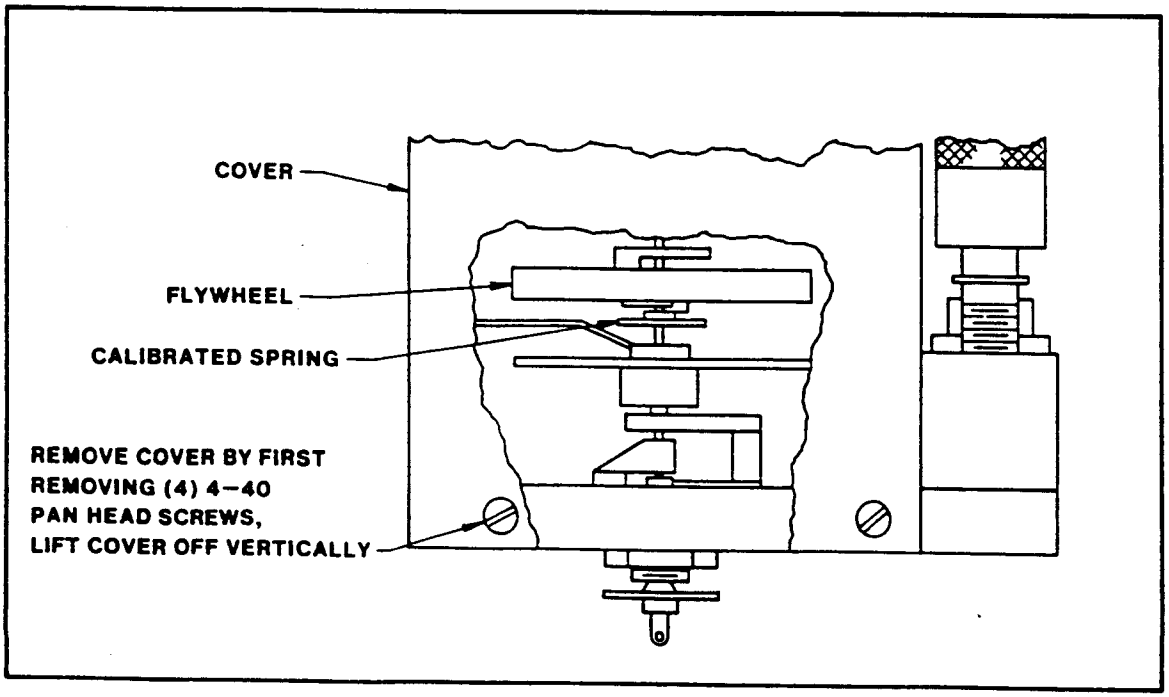
ZERO ADJUSTMENT PROCEDURE

WITH PNEUMATIC TRANSMITTER MOUNTED IN OPERATING POSITION AND CONNECTED TO CONTROLLER OR CONTROLLER/RECORDER, TURN ON TRANSMITTER MOTOR AND SUPPLY AIR. (SPINDLE DOES NOT NEED TO BE ATTACHED TO CHECK ZERO.)

INDICATING POINTER ON CONTROLLER OR CONTROLLER/RECORDER SHOULD READ '0' (ZERO).

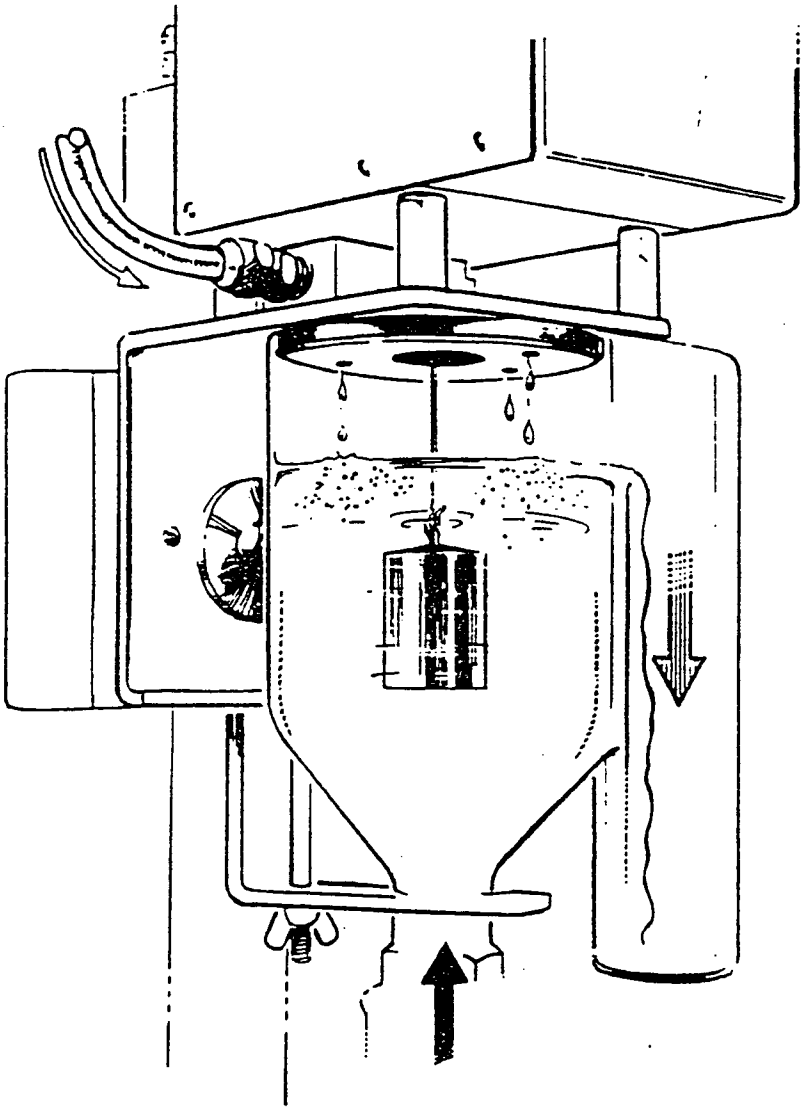
IF INDICATING POINTER DOES NOT READ ZERO UNDER THESE CONDITIONS, TURN OFF TRANSMITTER MOTOR (LEAVE SUPPLY AIR ON) AND ADJUST PRELOAD LEVER TO INCREASE OR DECREASE AS SHOWN IN VIEW AT LEFT. (NOTE: INDICATING POINTER 5% OR MORE OFF ZERO INDICATES BLOCKAGE OF AIR LINE OR OTHER DIFFICULTY WHICH ZERO ADJUSTMENT WILL NOT CORRECT.)

THE PRELOAD ADJUSTMENT IS STRICTLY A '0' ADJUSTMENT AND WILL NOT ALTER THE CALIBRATED SPAN OF THE INSTRUMENT.



BROOKFIELD ENGINEERING LABORATORIES, INC.

SAMPLE CHAMBER
SOLVENT ADDITION SYSTEM



Viscosel Model VTA120 supplied with either the VTA107-36Y or VTA107-33Y Sample Chamber Assembly has a feature for adding solvent directly into the sample chamber top.

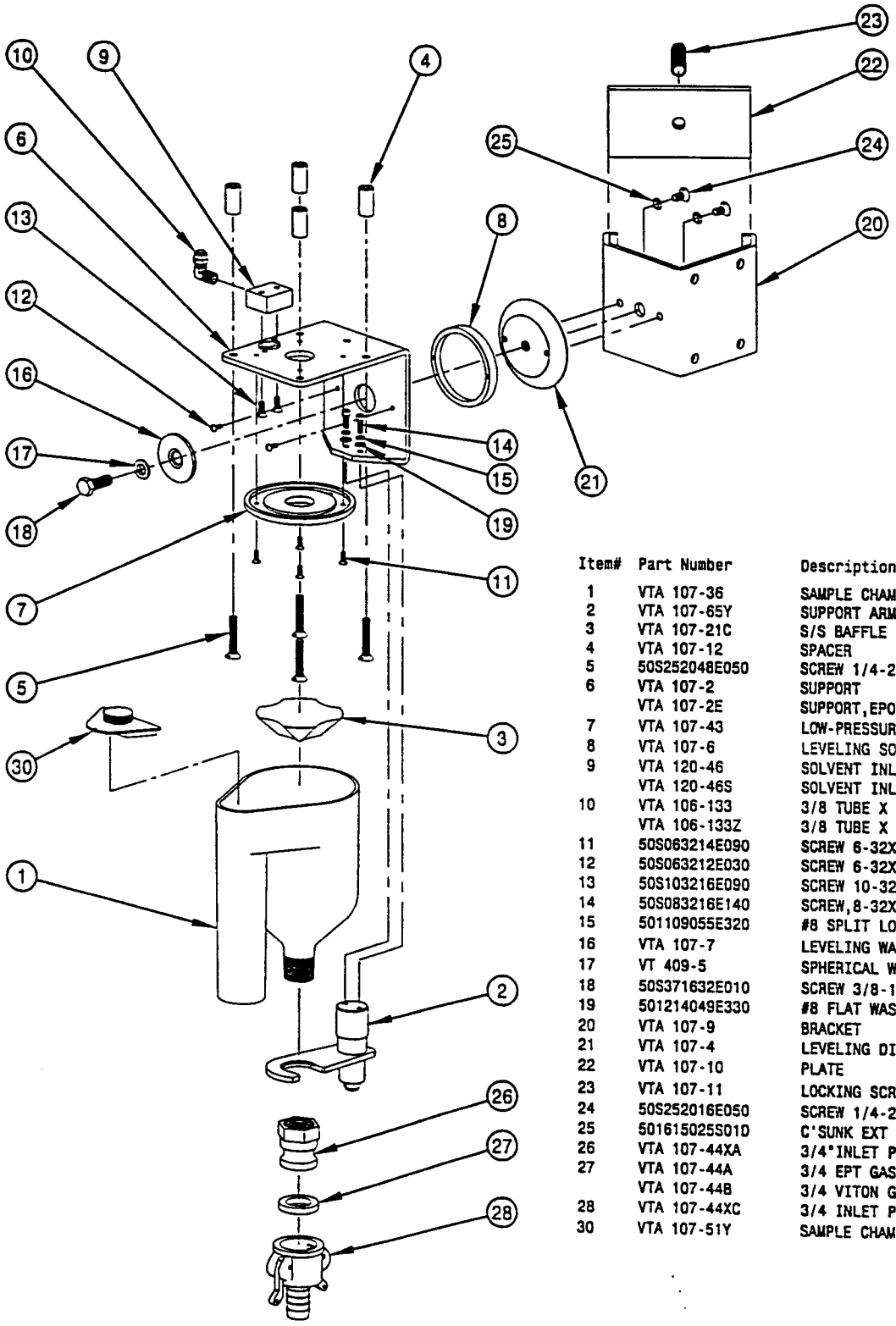
This location for addition of solvent to control viscosity of the process has been chosen for several reasons:

1. To insure good mixing of the solvent with the process fluid mainly because of the overflow and return to the system reservoir.

2. Solvent addition at this point in the chamber tends to keep the chamber clean and prevents buildup.

3. Should continuous flow of the sample to the chamber be cut off for any reason, the system is failsafe, and the only overdilution that will take place is within the chamber.

BROOKFIELD	TITLE	DOCUMENT NO.
CREATED BY M.D.	SPARE PARTS LIST FOR SAMPLE CHAMBER ASSEMBLIES VTA 107-36Y, VTA 107-36YS, VTA 107-36Y-E & VTA 107-36YS-E	CE4-008-3
APPROVED BY HWC		PAGE NO. 1 OF 1
DATE 5/15/85		REV. NO. 2 / DATE 4/19/01 / CHK BY



Item#	Part Number	Description	Qty
1	VTA 107-36	SAMPLE CHAMBER	1
2	VTA 107-65Y	SUPPORT ARM ASSEMBLY	1
3	VTA 107-21C	S/S BAFFLE PLUG	1
4	VTA 107-12	SPACER	4
5	50S252048E050	SCREW 1/4-20X1-1/2 SLT FLT HD	4
6	VTA 107-2	SUPPORT	1
	VTA 107-2E	SUPPORT,EPOXY COATED	1
7	VTA 107-43	LOW-PRESSURE INJECTION RING	1
8	VTA 107-6	LEVELING SOCKET	1
9	VTA 120-46	SOLVENT INLET BLOCK (BRASS)	1
	VTA 120-46S	SOLVENT INLET BLOCK (304 S.S.)	1
10	VTA 106-133	3/8 TUBE X 1/8 MPT ELBOW (BRASS)	1
	VTA 106-133Z	3/8 TUBE X 1/8 MPT ELBOW (316 S.S.)	1
11	50S063214E090	SCREW 6-32X7/16 SLT FLT HD S.S.	4
12	50S063212E030	SCREW 6-32X3/8 SLT RND HD S.S.	2
13	50S103216E090	SCREW 10-32X1/2 SLT FLT HD S.S.	2
14	50S083216E140	SCREW,8-32X1/2 SOC. HD. CAP	2
15	501109055E320	#8 SPLIT LOCK WASHER	2
16	VTA 107-7	LEVELING WASHER	1
17	VT 409-5	SPHERICAL WASHER	1
18	50S371632E010	SCREW 3/8-16X1 HEX HD BOLT S.S.	1
19	501214049E330	#8 FLAT WASHER	2
20	VTA 107-9	BRACKET	1
21	VTA 107-4	LEVELING DISC VTA 107-4	1
22	VTA 107-10	PLATE	1
23	VTA 107-11	LOCKING SCREW	1
24	50S252016E050	SCREW 1/4-20X1/2 SLT FLT HD S.S.	2
25	501615025S01D	C'SUNK EXT TOOTH LOCK WASHER	2
26	VTA 107-44XA	3/4"INLET PT A ADAPT X FEM NPT	1
27	VTA 107-44A	3/4 EPT GASKET FOR INLET (STANDARD)	1
	VTA 107-44B	3/4 VITON GASKET FOR INLET(OPTIONAL)	1
28	VTA 107-44XC	3/4 INLET PART C CPLR X HOSE	1
30	VTA 107-51Y	SAMPLE CHAMBER COVER ASSEMBLY	1

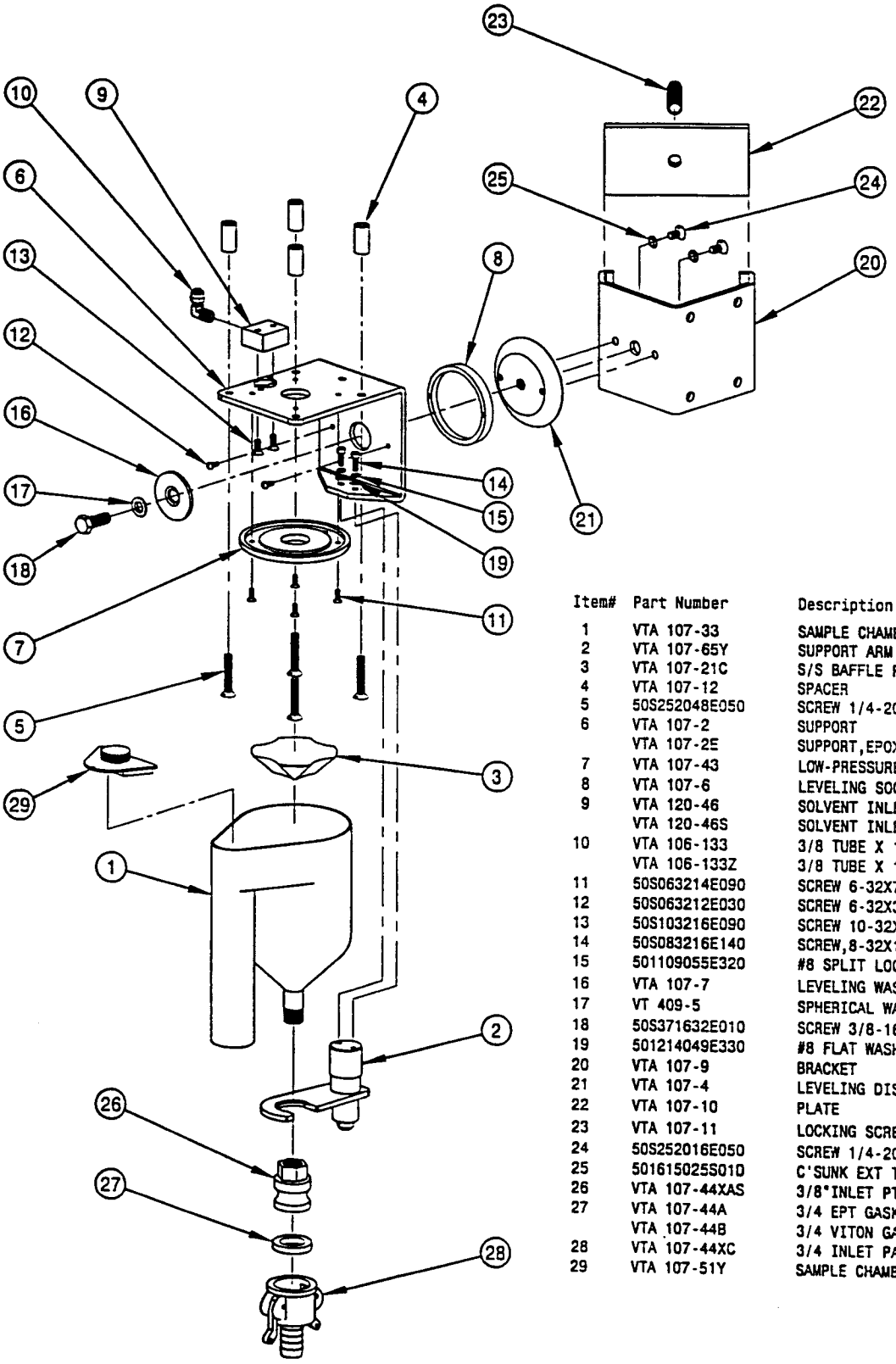
BROOKFIELD

CREATED BY	KFM
APPROVED BY	HWC
DATE	5/15/85

TITLE

SPARE PARTS LIST
FOR SAMPLE CHAMBER ASSEMBLIES
VTA 107-33Y, VTA 107-33YS,
VTA 107-33Y-E & VTA 107-33YS-E

DOCUMENT NO.	CE4-008-1	
PAGE NO.	1 OF 1	
REV. NO.	DATE	CHK. BY
2	4/19/01	



Item#	Part Number	Description	Qty
1	VTA 107-33	SAMPLE CHAMBER	1
2	VTA 107-65Y	SUPPORT ARM ASSEMBLY	1
3	VTA 107-21C	S/S BAFFLE PLUG	1
4	VTA 107-12	SPACER	4
5	50S252048E050	SCREW 1/4-20X1-1/2 SLT FLT HD	4
6	VTA 107-2	SUPPORT	1
	VTA 107-2E	SUPPORT,EPOXY COATED	1
7	VTA 107-43	LOW-PRESSURE INJECTION RING	1
8	VTA 107-6	LEVELING SOCKET	1
9	VTA 120-46	SOLVENT INLET BLOCK (BRASS)	1
	VTA 120-46S	SOLVENT INLET BLOCK (304 S.S.)	1
10	VTA 106-133	3/8 TUBE X 1/8 MPT ELBOW (BRASS)	1
	VTA 106-133Z	3/8 TUBE X 1/8 MPT ELBOW (316 S.S.)	1
11	50S063214E090	SCREW 6-32X7/16 SLT FLT HD S.S.	4
12	50S063212E030	SCREW 6-32X3/8 SLT RND HD S.S.	2
13	50S103216E090	SCREW 10-32X1/2 SLT FLT HD S.S.	2
14	50S083216E140	SCREW,8-32X1/2 SOC. HD. CAP	2
15	501109055E320	#8 SPLIT LOCK WASHER	2
16	VTA 107-7	LEVELING WASHER	1
17	VT 409-5	SPHERICAL WASHER	1
18	50S371632E010	SCREW 3/8-16X1 HEX HD BOLT S.S.	1
19	501214049E330	#8 FLAT WASHER	2
20	VTA 107-9	BRACKET	1
21	VTA 107-4	LEVELING DISC VTA 107-4	1
22	VTA 107-10	PLATE	1
23	VTA 107-11	LOCKING SCREW	1
24	50S252016E050	SCREW 1/4-20X1/2 SLT FLT HD S.S.	2
25	501615025S01D	C'SUNK EXT TOOTH LOCK WASHER	2
26	VTA 107-44XAS	3/8"INLET PT A ADAPT X FEM NPT	1
27	VTA 107-44A	3/4 EPT GASKET FOR INLET (STANDARD)	1
	VTA 107-44B	3/4 VITON GASKET FOR INLET(OPTIONAL)	1
28	VTA 107-44XC	3/4 INLET PART C CPLR X HOSE	1
29	VTA 107-51Y	SAMPLE CHAMBER COVER ASSEMBLY	1

QUICK DISCONNECT COUPLINGS FOR VTA107-33/36 SAMPLE CHAMBERS

PART NUMBER	DESCRIPTION	DWG. NO.	PRICE US$
VTA 107-44	3/4" Inlet Q/D Coupling Assembly (VTA107-36 only)	CE4-008	
VTA 107-44S	3/8 Inlet Q/D Coupling Assembly (VTA107-33 & 56Y only)		
VTA 107-44XA	3/4" Inlet, Part A Adapter X- Female npt (VTA107-36 only)		
VTA 107-44XAS	3/8" Inlet, Part A Adapter X- Female npt (VTA107-33 only)		
VTA 107-44XC	3/4" Inlet, Part C Coupler X - Hose Shank		
VTA 107-44A	3/4" EPT Gasket for Inlet		
VTA 107-44B	3/4" Viton Gasket for Inlet		
VTA 107-45	1 1/4" Outlet		
VTA 107-45XA	1 1/4" Outlet, Part A		
VTA 107-45XC	1 1/2" Outlet, Part C		
VTA 107-45A	1 1/2" EPT Gasket for Outlet		
VTA 107-45B	1 1/2" Viton Gasket for Outlet		

GasketMaterial:

EPT(EthylenePropyleneTerpolymer)
Coded by White Stripe

Viton
Coded by Yellow Stripe

PLEASE FURNISH INSTRUMENT SERIAL NUMBER WHEN ORDERING SPARE PARTS. MINIMUM ORDER AMOUNT - $25.00

Viscosity values tabulated in the Viscosel Spindle Range Chart are the maximum range in centipoise for a given numbered spindle operating under the following conditions:

1. The rotational speed of the spindle is normally 50 rpm. For speeds other than 50 rpm an appropriate factor must be used to determine new range.

2. The notation 1/2 RV, RV - identifies the instrument torsion element. The most commonly used elements are listed below.

Viscometer Torsion Element	Full Scale Torque
.25 RV	1,796 Dyne/Centimeters
.5 RV	3,593 " "
RV	7,187 " "
1.25 HA	17,967 " "
2.50 HA	35,935 " "
1.25 HB	71,870 " "

The 1/4 RV element is generally specified for thin fluids and the higher torque elements for more viscous fluids.

3. Because the radius of the spindle and container are used in the calculation for the spindle range, it is required that the spindle be located in the center of the specified diameter container (i.e., sample chamber or baffle tube).

4. The spindle must be completely immersed in a Newtonian fluid such as motor oil or silicone. Allow 1/2 to 1" depth of fluid above and below spindle.

Example :

Spindle VTA-SP-35 used with Viscometer equipped with 1/2 RV torsion element has a range of 100 centipoise at 50 rpm. The range of this spindle at 20 rpm would be:

$$\frac{50 \text{ rpm}}{20 \text{ rpm}} \times 100 \text{ centipoise} = 250 \text{ cps.}$$

Note:

1. For reproducible results in the measurement of viscosity, the temperature must be kept constant. An extremely small temperature change can cause an extremely large viscosity change. Motor oil (S.A.E. #50) will change its viscosity about 5% for a 1°F change at 77°F.

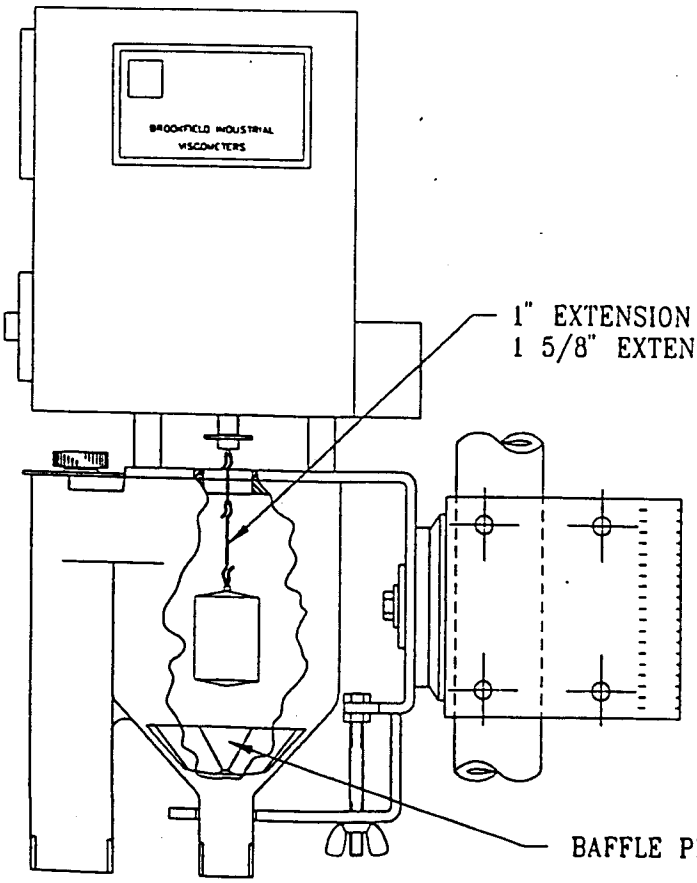
2. Instrument accuracy is ± 1% of its full scale range; therefore, it is important to make all viscosity measurements above 10% of its full scale, preferably 20%.

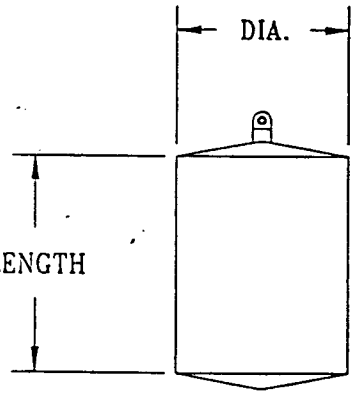
3. When making a viscosity measurement of a fluid below 50 centipoise at spindle speeds in excess of 20 rpm, an error will be introduced caused by turbulence. In general, the indicated viscosity will be greater than the actual viscosity. Because the instrument readings are reproducible under these conditions, the Viscometer may be used for control.

BROOKFIELD	TITLE	DOCUMENT NO. CE4-005
CREATED BY KFM	VISCOSEL SPINDLE RANGES	PAGE NO. 1 OF 1
OVED BY HWC		REV. NO. 1 / DATE 9/2/92 / CHK. BY SAR
DATE 9/19/91		

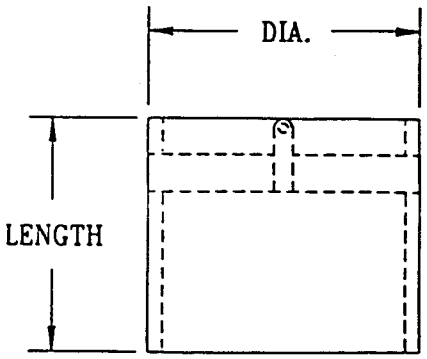
SPINDLE NUMBER	FULL SCALE RANGE AT 50 RPM		SPINDLE SIZE		SPINDLE TYPE
	1/4 RV	1/2 RV	DIAMETER	LENGTH	
VTA SP-35	35	100	1.887	1.600	HOLLOW CYLINDRICAL
VTA SP-100	100	200	1.475	1.900	CLOSED CONICAL
VTA SP-200	200	400	1.200	1.485	CLOSED CONICAL
VTA SP-300	300	600	1.075	1.229	CLOSED CONICAL
VTA SP-400	400	800	.992	1.060	CLOSED CONICAL
VTA SP-500	500	1000	.953	.892	CLOSED CONICAL
VTA SP-1000	1000	2000	.718	.855	CLOSED CONICAL

RANGES IN 3.875 DIA. VESSELS





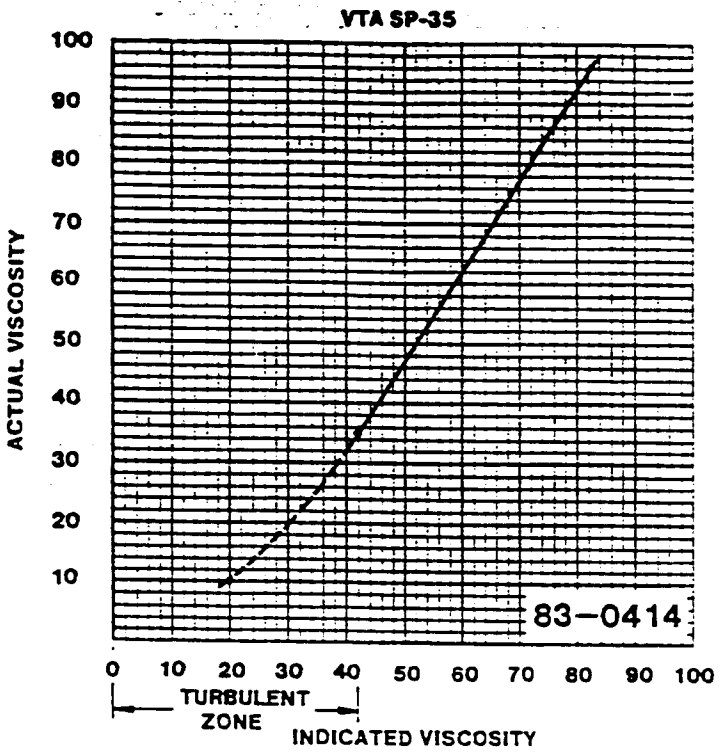
CLOSED CONICAL SPINDLE

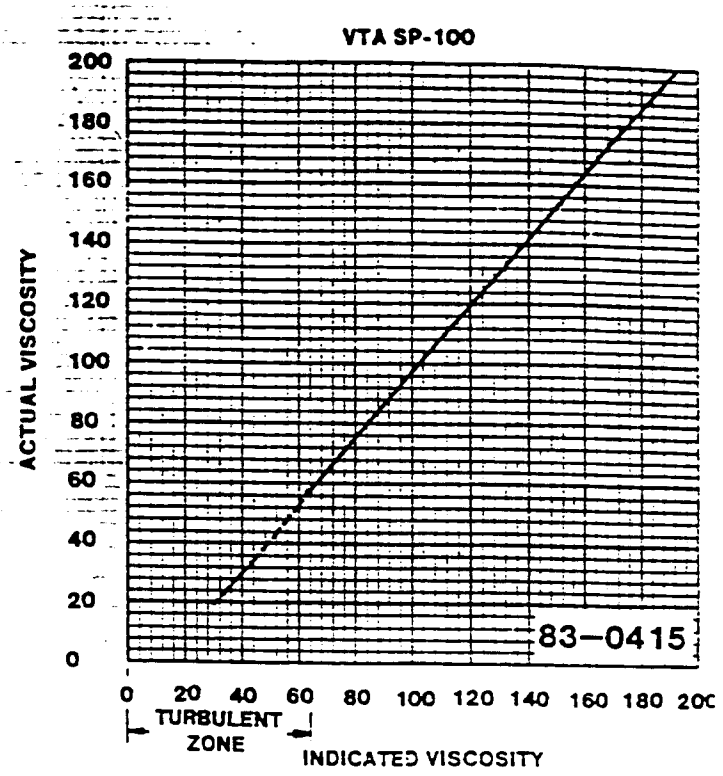


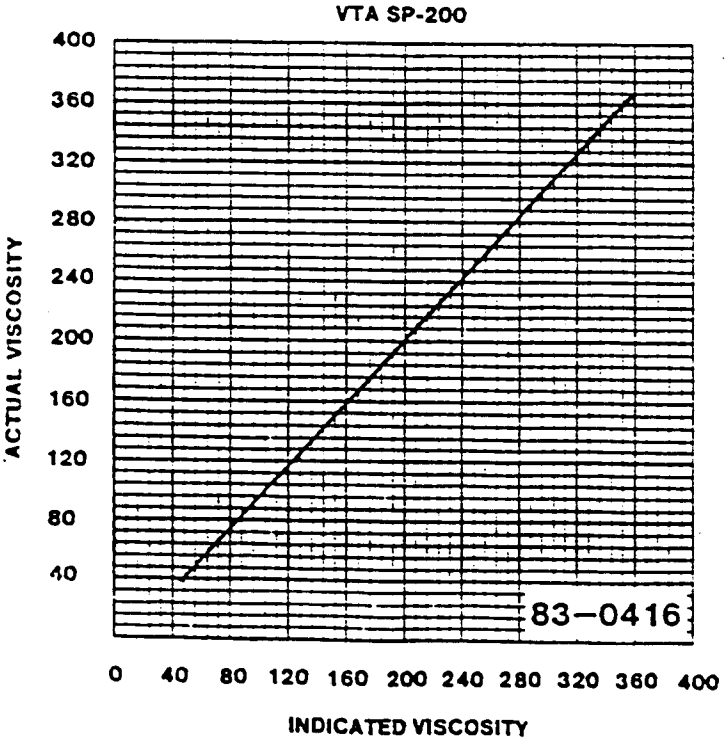
HOLLOW CYLINDRICAL SPINDLE

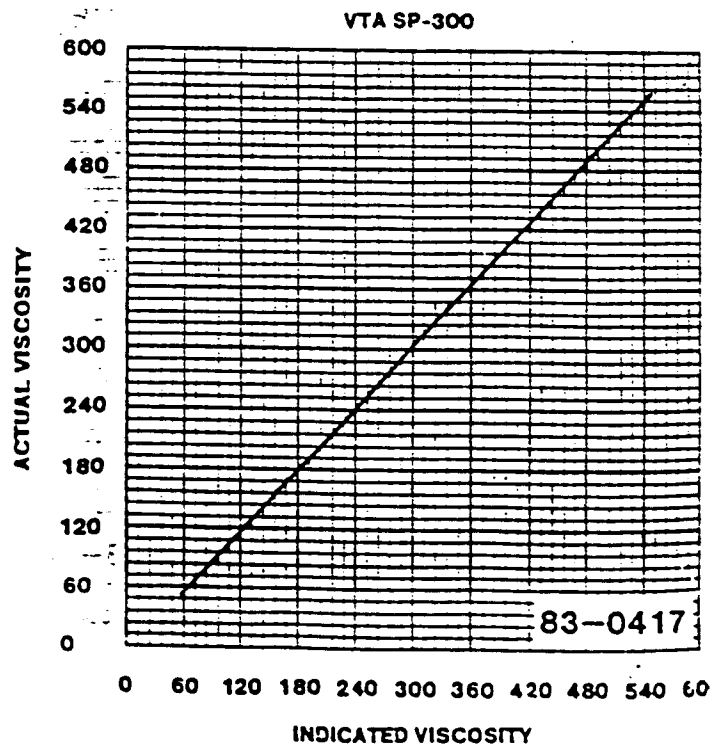
BROOKFIELD ENGINEERING LABORATORIES, INC.

SPINDLE CALIBRATION CURVE
NEWTONIAN VISCOSITY COMPARISON
INDICATED VS. ACTUAL





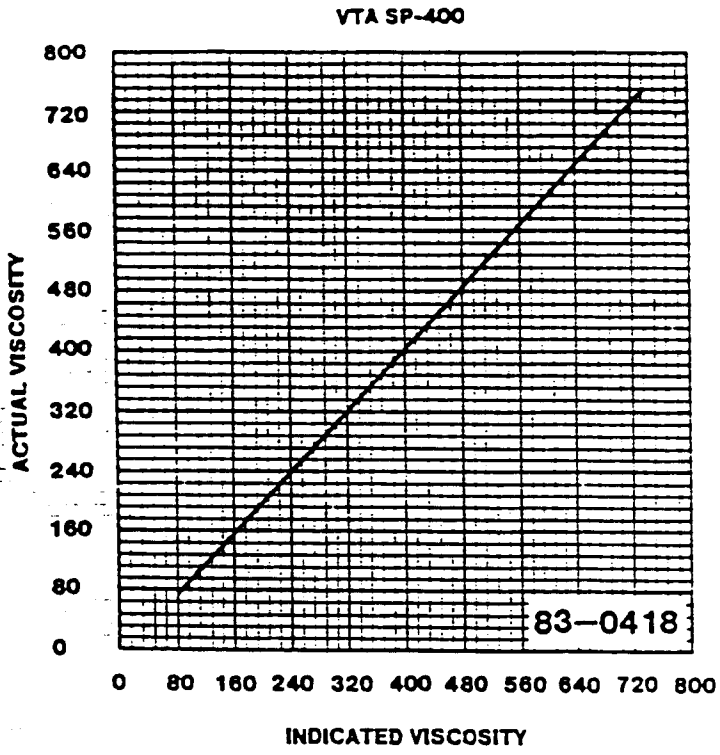


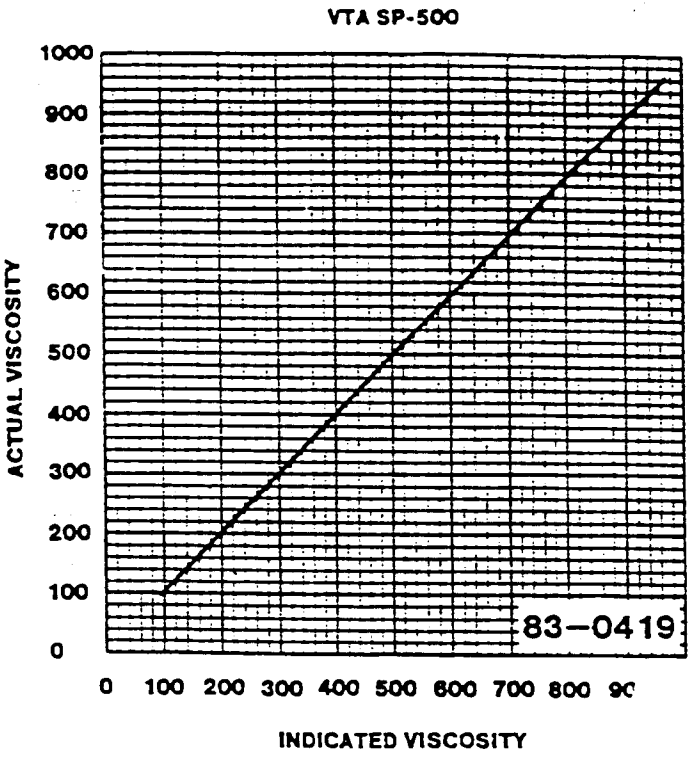


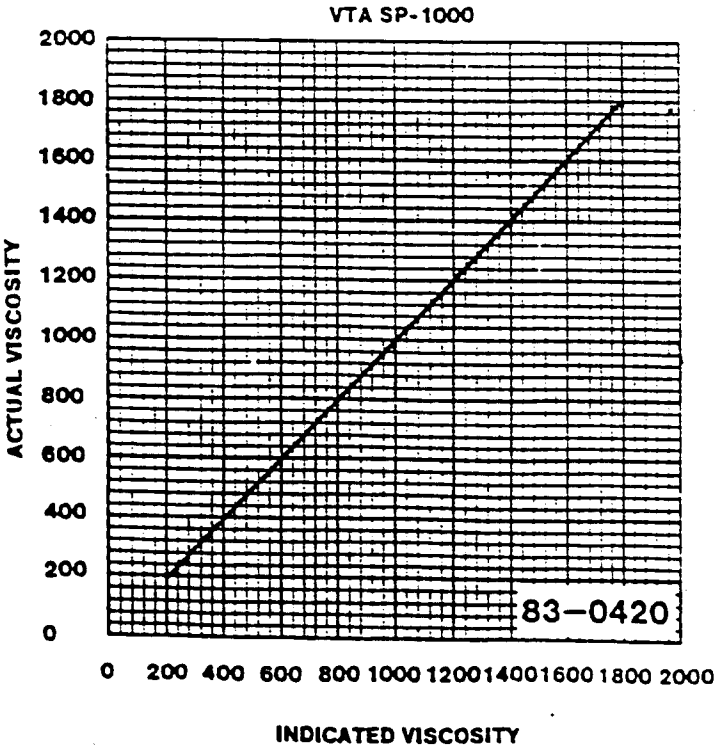
REF. SPINDLE RANGE CHART DWG. NO. 83–0413

(OVER)

83–0509







LAMINAR VERSUS TURBULENT FLOW

In laminar flow the layers of the fluid being sheared move smoothly across one another in a steady, predictable fashion. At some point, depending on rate of shear, fluid inertia, fluid viscosity, and general shearing geometry, the ability of the fluid to dissipate the energy being introduced by the shearing mechanism becomes inadequate for laminar flow and the fluid particles start to move in a random and chaotic manner. This is called turbulent flow, and it results in an artificially high indication of viscosity.

BROOKFIELD

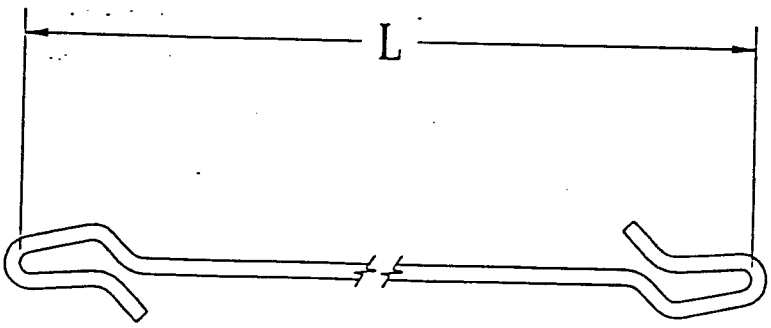
CREATED BY	KFM
D BY	HWC
DATE	9/12/91

TITLE

SPINDLE EXTENSIONS

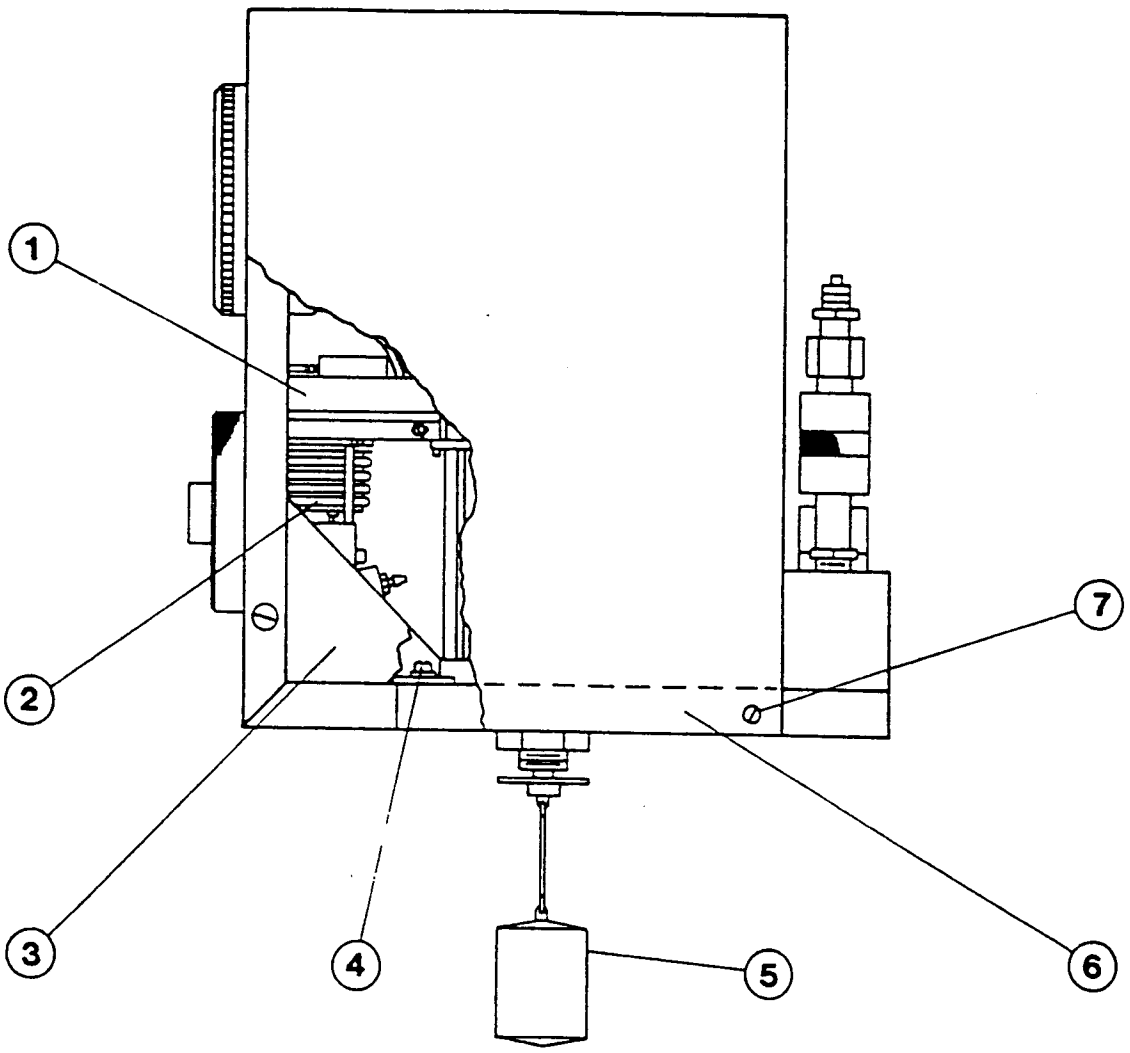
DOCUMENT NO.	AA4-013
PAGE NO.	1 OF 1

REV. NO.	DATE	CHK. BY
1	9/2/92	R.D.A.



PART NO.	LENGTH "L"
SXV-08	1"
SXV-10	1-1/4"
SXV-12	1-1/2"
SXV-13	1-5/8"
SXV-14	1-3/4"
SXV-16	2"
SXV-20	2-1/2"
SXV-24	3"
SXV-32	4"
SXV-48	6"
SXV-56	7"
SXV-64	8"
SXV-72	9"
SXV-80	10"
SXV-88	11"
SXV-96	12"

VISCOSEL MODEL VTA 120
PARTS IDENTIFICATION



ITEM	PART NO.	DESCRIPTION	QTY.
::1	AMP-3Y	AMPLIFIER ASSEMBLY	1
::2	VTA120-4Y	CONTROLLER ASSEMBLY	1
::3	VTA120-3Y	CONTROLLER & AMPLIFER ASS'Y	1
4	-	1/4-20 X 1/2 FILL. HD. SCREW	2
5	-	SPINDLE	1
6	VTA120-3A	COVER	1
7	-	4-40 X 1/4 PAN HD. SCREW	4

NOTE:

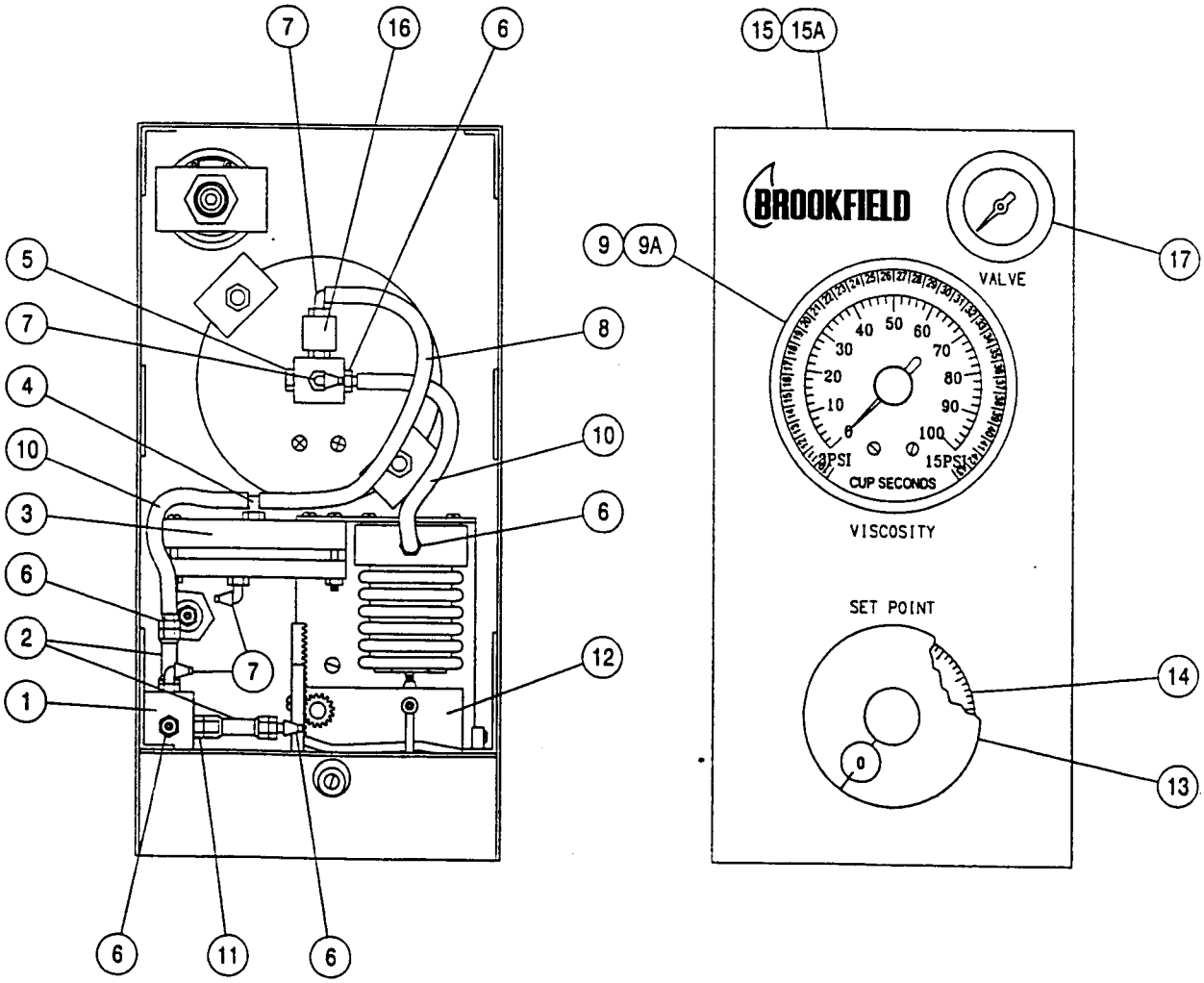
1. FOR EXTERNAL PARTS IDENTIFICATION SEE INSTRUCTION SHEET CE4-011

2. FOR MOUNTING & CLEARANCE DIMENSIONS SEE INSTRUCTION SHEET 75-0620

:: SEE INSTRUCTION SHEET 77-0831

BROOKFIELD	TITLE	DOCUMENT NO.
CREATED BY M.D.	VTA 120-3Y BEL, VTA 120-3Y GM, VTA 120-3Y BND CONTROLLER & AMPLIFIER PARTS IDENTIFICATION	CE4-055
APPROVED BY		PAGE NO. SHT. 1 OF 1
DATE 8/7/02		REV. NO / DATE / CHK. BY

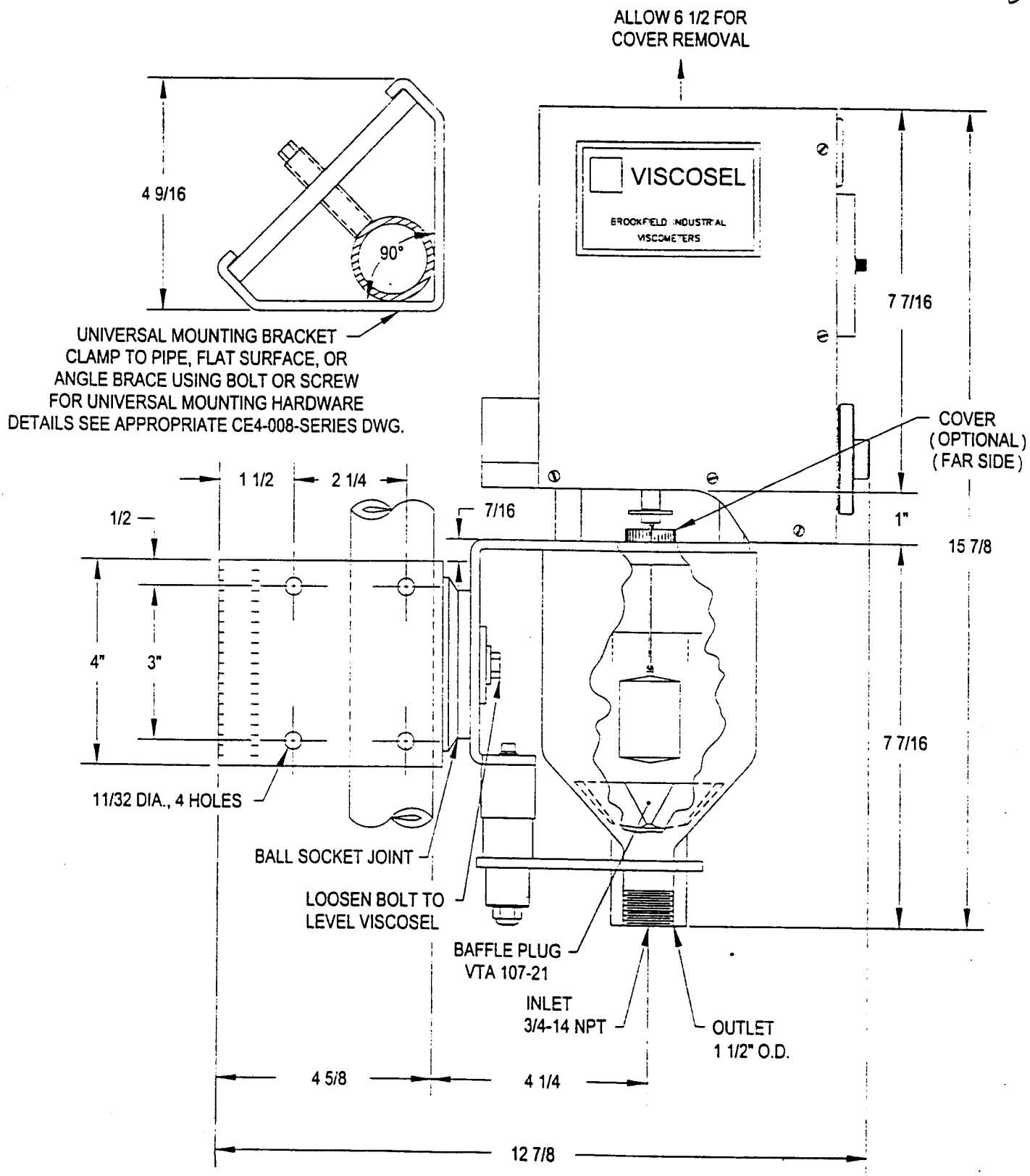
1.	VTA 120-92Y	AIR MANIFOLD ASSEMBLY	10.	1/8 I.D. X 3 1/2 LG. TYGON TUBING (2)	
2.	VTA 110-17A	4LR-010-D08 RESTRICTOR (2)	11.	VTA 110-15	4TC-022 HEX NIPPLE
* 3.	AMP-3Y	AMPLIFIER ASSEMBLY	** 12.	VTA 120-94Y	CONTROLLER & FRAME ASSEMBLY
4.	VTA 110-28	XT230-1 TEE FITTING	13.	VTA 120-24Y	DIAL INDICATOR ASSEMBLY
5.	VTA 110-16	4TC-023 10-32 PLUG	14.	VTA 120-23Y	DIAL PLATE ASSEMBLY
6.	VTA 110-12	4TC-021 CONNECTOR (6)	15.	VTA 120-91 BEL	CONTROL PANEL (BROOKFIELD)
7.	VTA 110-25	XL230-2 ELBOW (4)	15A.	VTA 120-91 GM	CONTROL PANEL (GRAY MILLS)
8.	1/8 I.D. X 5 1/2 LG. TYGON TUBING		16.	RLD-13Y	DAMPENER ASSEMBLY
9.	VTA 120-2YCS	3-15 PSI GAUGE ASSY. w/CUP SECONDS	17.	VTA 120-82Y	0 - 30 PSI GAUGE ASSEMBLY
9A.	VTA 120-2Y	3-15 PSI GAUGE ASSEMBLY (USED ONLY ON: VTA 120-3Y BND)			



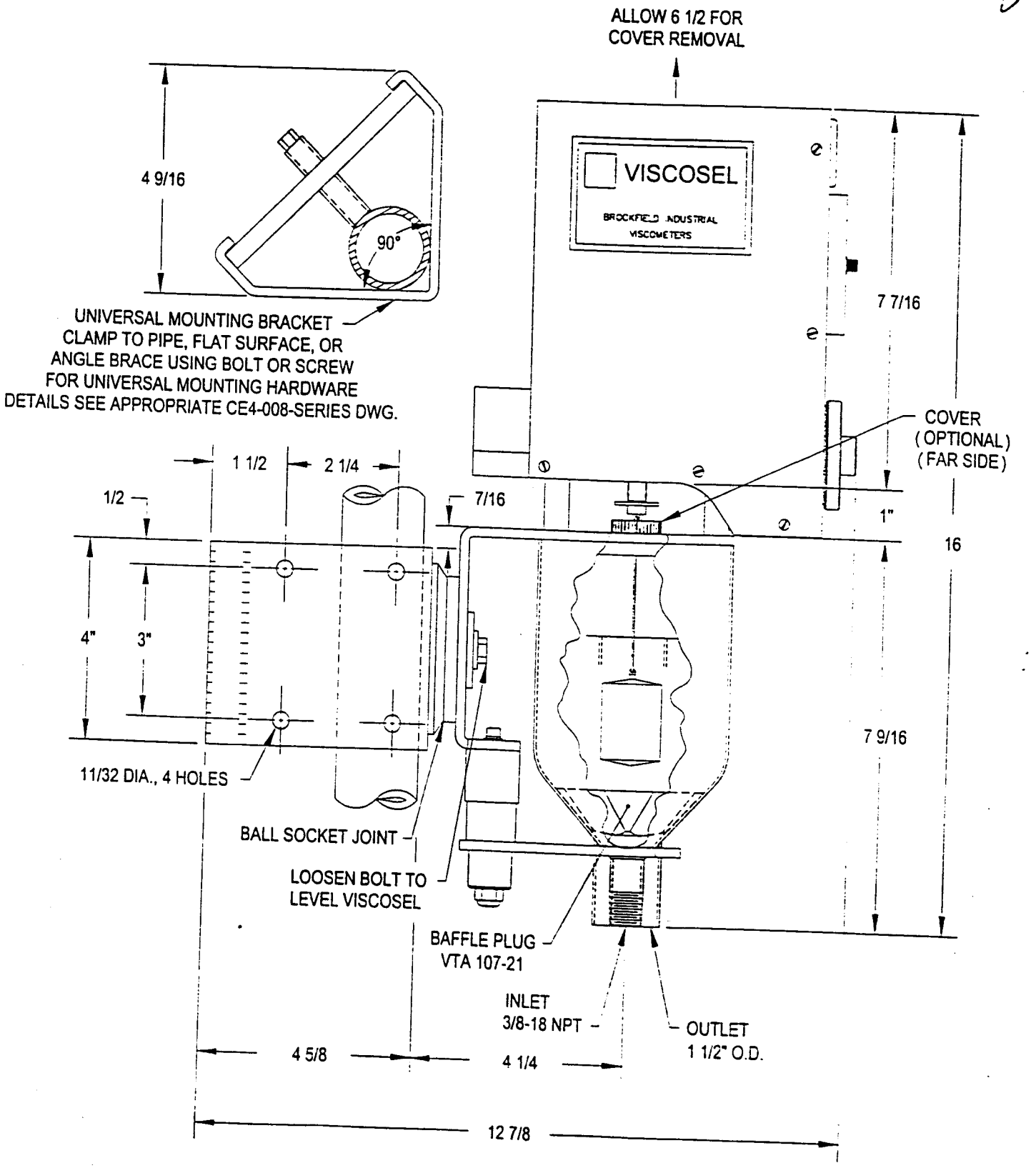
* SEE PARTS IDENTIFICATION DWG. # 83-0827

** SEE PARTS IDENTIFICATION DWG. # 77-0829

BROOKFIELD	TITLE	DOCUMENT NO.
CREATED BY KFM	VISCOSEL SAMPLE CHAMBER VTA 107-36	CE3-002
APPROVED BY HWC		PAGE NO. 1 OF 1
DATE 6/6/91		REV. NO. 3 / DATE 8/6/02 / CHK. BY



BROOKFIELD	TITLE	DOCUMENT NO.
CREATED BY KFM	VISCOSEL	CE3-003
APPROVED BY HWC	SAMPLE CHAMBER VTA 107-33	PAGE NO. 1 OF 1
DATE 9/27/96		REV. NO. 2 / DATE 8/6/02 / CHK. BY



NOTE: THIS DWG. SUPERCEDES DWG. #80-1126

VISCOSEL MODEL VTA – AIR MOTOR
Recommended Spare Parts

NOTE: BEFORE PLACING PARTS ORDER, PLEASE REVIEW YOUR VISCOMETER SPECIFICATION SHEET LOCATED IN THE OPERATING MANUAL. INSTRUMENT SERIAL NUMBER MUST BE NOTED ON PURCHASE ORDER.
MINIMUM ORDER AMOUNT - US$25.00

PART NO.	DESCRIPTION
VTA 100-5Y	Bubble level replacement kit
VTA 100-10	Tygon tubing, 3/32" diameter i.d. (per foot)
VTA 100-13	Tygon tubing, 1/8" diameter i.d. (per foot)
VTA 107-46	Flat polyethylene tubing (disposable), 3" i.d. X .004 wall
VTA-SP-	Viscosel spindle (Standard spindles only - VTA-SP-35, 100, 200,300, 400, 500, or 1000)
SXV-	Spindle extensions (SXV-08 thru SXB-96)
VTA SPE-14Y	Flexible spindle extension (Please specify length when ordering)
VTA SPE-15Y	Adjustable flexible spindle extension (Please specify length when ordering)
PN 200-4	Bearings (two required)
PN 201-2Y	Second reduction gear assembly
PN 202-18Y	Air motor turbine assembly
PN 202-44	Air motor gasket
VTA 110-14A	Critical flow orifice assembly (1/4 RV - Blue)
VTA 110-17A	Critical flow orifice assembly (1/2 RV - Red)
VTA 110-12	Connector
VTA 110-15	Hex nipple
VTA 110-25	Elbow 77-0831
VTA 110-28	Tee fitting
C-100-BR	Orifice screw
PN-50	Air motor, 1800 RPM, complete
VTA 120-2Y	3-15 psi gauge assembly *
VTA 120-4Y	Controller assembly *
AMP-3Y	Amplifier assembly *
RLD-13Y	Dampener
VTA 102-28Y	Idler gear
VTA 102-25	Driven gear
VTA 102-29	Idler gear shaft lock
UHR-10REV.A	Pivot point

NOTE: This list is applicable to VTA120. All items are applicable to VTA110 except *.

PLEASE FURNISH INSTRUMENT SERIAL NUMBER WHEN ORDERING SPARE PARTS.
MINIMUM ORDER AMOUNT - $25.00

VISCOSEL PRICE LIST
System Components

PART NUMBER	DESCRIPTION
SAMPLE CHAMBERS FOR VTA AND VTE:	
VTA 107-33	Sample chamber, stainless steel (Inlet: 3/8"-18 NPT Outlet: 1 1/2" O.D.)
VTA 107-56Y	Sample chamber, stainless steel. Same as VTA 107-33 above but with threaded welded nipple on chamber outlet. (Inlet: 3/8"-18 NPT Outlet: 1 1/4" - 11 1/2 NPT)
VTA 107-33Y	Sample chamber, stainless steel, with quick disconnect on chamber inlet, universal mounting bracket, brass solvent addition fittings. (1) (Inlet: 3/8"-18 NPT Outlet: 1 1/2" O.D.)
VTA 107-33AY	Sample chamber, stainless steel, with quick disconnect on chamber inlet, universal mounting bracket, no solvent inlet block. (2) (Inlet: 3/8"-18 NPT Outlet: 1 1/4" – 11 1/2 NPT)
VTA 107-33YS	Sample chamber, stainless steel, with quick disconnect on chamber inlet, universal mounting bracket, brass solvent addition fittings. (1) (Inlet: 3/8"-18 NPT Outlet: 1 1/4"-11 1/2 NPT)
VTA 107-33TY	Sample chamber, stainless steel, with threaded welded nipple on chamber outlet (VTA 107-56Y), quick disconnect on chamber inlet, universal mounting (1) bracket, brass solvent addition fittings. Add $37 for VTA 107-45 quick disconnect on chamber outlet. (Inlet: 3/8"-18 NPT Outlet: 1-1/4"-11-1/2 NPT)
VTA 107-33TAY	Sample chamber, stainless steel, with quick disconnect on chamber inlet, universal mounting bracket. No solvent addition block. (2) (Inlet: 3/8"-18 NPT Outlet: 1-1/4"-11-1/2 NPT)
VTA 107-33TYS	Sample chamber, stainless steel, with threaded welded nipple on chamber outlet (VTA107-56Y), quick disconnect on chamber inlet, universal mounting bracket, s/s solvent addition fittings. Add $37 for VTA107-45 quick disconnect (1) on chamber outlet. (Inlet: 3/8"-18 NPT Outlet: 1 1/4"-11 1/2 NPT)
VTA 107-36	Sample chamber, Delrin (acetal) plastic (Inlet: 3/4"-14 NPT Outlet: 1 1/2" O.D.)
VTA 107-36Y	Sample chamber, Delrin (acetal) plastic, with quick disconnect on chamber (1) inlet, universal mounting bracket, brass solvent addition fittings. (Inlet: 3/4"-14 NPT Outlet: 1 1/2" O.D.)
VTA 107-36AY	Sample chamber, Delrin (acetal) plastic, with quick disconnect on chamber inlet, (2) universal mounting bracket, no solvent inlet block (Inlet: 3/8"-18 NPT Outlet: 1 1/4" – 11 1/2 NPT)
VTA 107-36YS	Sample chamber. Delrin (acetal) plastic, with quick disconnect on chamber (1) inlet, universal mounting bracket, s/s solvent addition fittings. (Inlet: 3/4"-14 NPT Outlet: 1 1/2" O.D.)
VTA 107-36T	Sample chamber, Delrin (acetal) plastic, with threaded outlet (Inlet: 3/4"-14 NPT Outlet: 1 1/4-11 1/2 NPT)
VTA 107-36TY	Sample chamber, Delrin (acetal) plastic, with threaded chamber outlet, quick (1) disconnect on chamber inlet, universal mounting bracket, brass solvent addition fittings. Add $37 for VTA 107-45 quick disconnect on chamber outlet. (Inlet: 3/4"-14 NPT Outlet: 1 1/4-11 1/2 NPT)
VTA 107-36TAY	Sample chamber, stainless steel, with quick disconnect on chamber inlet, (2) universal mounting bracket, no solvent inlet block (Inlet: 3/8"-18 NPT Outlet: 1 1/4" - 11 1/2 NPT)
VTA 107-36TYS	Sample chamber, Delrin (acetal) plastic, with threaded chamber outlet, quick disconnect on chamber inlet, universal mounting bracket, s/s solvent addition (1) fittings. Add $37 for VTA 107-45 quick disconnect on chamber outlet. (Inlet: 3/4"-14 NPT Outlet: 1 1/4-11 1/2 NPT)
VTA 107-2	Sample chamber/ viscosel support

Notes:

(1) use with all VTEs and VTA with remote mounted valve.

(2) use with VTA only, using bracket mounted valves SCV-1Y, SCV-51Y and SCV-101Y

VISCOSEL PRICE LIST
System Components

PART NUMBER	DESCRIPTION
SAMPLE CHAMBER OPTIONS FOR VTA AND VTE	
VTA 107-62Y	Universal mounting bracket for all preceding chambers
VTA 107-21C	Baffle plug
VTA 107-32	Teflon-coated baffle plug
VTA 107-51Y	Cover for VTA 107-36 or VTA 107-33 Sample Chambers
VTA 107-44	Quick disconnect for VTA 107-36 sample chamber inlet
VTA 107-44S	Quick disconnect for VTA 107-56Y/VTA 107-33 sample chamber inlet
VTA 107-45	Quick disconnect for VTA 107-36T, 33T & 56Y sample chamber outlet
VTA 107-46	Flat polyethylene tubing (disposable), 3" i.d. X .004 wall, priced per foot
VALVES FOR INSTRUMENTS AS INDICATED:	
SCV-1HY	1/4" Brookfield valve, stainless steel, threaded inlet, for mounting under Viscosel (VTA) (requires new VTA 107-2 bracket for VTA's shipped before 2/00)*
SCV-1HAY	1/4" Brookfield valve, stainless steel, threaded inlet/outlet, for remote mounting (VTA)*
SCV-51Y	1/4" Brookfield valve, stainless steel (brass accessory hardware, clamp mount between viscosel & sample chamber on support bracket (VTA)*
SCV-50AY	1/4" Brookfield valve, stainless steel (brass accessory hardware, clamp mount to post (VTA)*
SCV-101Y	1/4" Brookfield valve, stainless steel (SS accessory hardware, clamp mount between viscosel & sample chamber on support bracket (VTA)*
SCV-100AY	1/4" Brookfield valve, stainless steel (SS accessory hardware, clamp mount to post (VTA)*
VTA 106-155Y	1/4" Solenoid valve, 115v 60hz stainless steel, with brass accessory hardware and filter (VTE, PVT230, TT220)
VTA 106-156Y	1/4" Solenoid valve, 115v 50hz stainless steel, with brass accessory hardware and filter (VTE, PVT230, TT220)
VTA 106-157Y	1/4" Solenoid valve, 230v 50hz stainless steel, with brass accessory hardware and filter (VTE, PVT230, TT220)
VTA 106-158Y	1/4" Solenoid valve, 230v 60hz stainless steel, with brass accessory hardware and filter (VTE, PVT230, TT220)
VTA 106-155YS	1/4" Solenoid valve, 115v 60hz stainless steel, with s/s accessory hardware and filter (VTE, PVT230, TT220)
VTA 106-156YS	1/4" Solenoid valve, 115v 50hz stainless steel, with s/s accessory hardware and filter (VTE, PVT230, TT220)
VTA 106-157YS	1/4" Solenoid valve, 230v 50hz stainless steel, with s/s accessory hardware and filter (VTE, PVT230, TT220)
VTA 106-158YS	1/4: Solenoid valve, 230v 60hz stainless steel, with s/s accessory hardware and filter (VTE, PVT230, TT220)
VTA 106-104AY	Air set (air filter, regulator, and gauge) (VTA)

*12 psi maximum solvent inlet pressure.

VISCOSEL PRICE LIST
System Components

PART NUMBER	DESCRIPTION
STANDS AND SOLVENT CONTAINERS FOR VTA & VTE:	
SB-19Y	Pipe stand (SB-2) with 2-gallon plastic solvent bottle (SB-10Y) and valve (SB-20AY), solvent bottle holder (SB-1Y), and portable base (SB-9Y)
SB-22Y	Pipe stand (SB-2) with 2-gallon plastic solvent bottle (SB-10Y) and valve (SB-20AY), solvent bottle holder (SB-1Y), and round weighted base (SB-3Y)
SB-10Y	Solvent bottle, 2-gallon (plastic), with SB-20AY (brass) valve assembly **NOTE: Solvent bottle, 2-gallon (plastic) may not be approved for use with volatile solvents - check local code.**
SB-10Y PH	Solvent bottle, 2-gallon (plastic), with SB-20AY PH (stainless steel) valve assembly
SB-10	Modified 2 gal. Solvent bottle
SB-20AY	Valve assembly for use with above solvent bottle (brass)
SB-20AY PH	Valve assembly for use with above solvent bottle (stainless steel)
SB-1Y	Solvent bottle holder for 2-gallon (plastic) solvent bottle
SB-11	Solvent can, 3-gallon, (metal), with brass valve assembly
SB-12	Solvent can, 5-gallon, (metal), with brass valve assembly. Not for use on base-mounted stand.
SB-7Y	Solvent can holder for 3 or 5 gallon (metal) solvent can
SB-3Y	Base (round, weighted)
SB-9Y	Portable base (rectangular with casters)
SB-2	Solvent bottle column, 48" in length