

SAV-09 Semi-automatic Falling Rod Viscometer Set up and operating Instructions

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1.0 Overview:

This system will provide a Falling Rod Viscometer with a direct connection to a PC. This system features 2 rod sensors (eyes), a digital timer with a USB connection and a temperature probe with a USB connection.

The software included with this system will automatically instruct the operator of the test process and will automatically collect all data. The operator will not be required to “key in” any of the test data.

2.0 Components

2.1 Rod Sensors (eyes) - These sensors monitor the presence of the rod as it passes the upper and lower sensors. These sensors are placed 100mm apart hence set up the time basis for this test. We have several different size mounting blocks available for the sensors to accommodate the different types of stands that are in use.

2.2 Temperature sensor - A temperature sensor is provided to measure the temperature of the collar. This sensor is designed to be a precision fit in the thermometer pocket machined in the collar. A USB connection is provided on this sensor so it can interface directly with the PC.

2.3 Elapse Time Indicator - This Elapsed Time Indicator measures the time

required for the rod to pass from the upper to the lower sensor and displays this value in 0.01 seconds on the front of the Indicator. This instrument also provides a USB interface for the time data to enter the PC.

2.4 Optional Water Collar - This collar will allow the operator to circulate temperature controlled water around the test collar to help maintain sample temperature.

3.0 Viscometer Stand set-up and Installation

3.1 Rod Sensors - Attach the rod sensors to the support column on the support stand as shown in Figure 3. Notches have been provided 100mm apart on the support column to provide proper spacing. Attach the “start” sensor at the top notch and the “Stop” sensor at the bottom notch.

3.2 Optional Water Collar - Install the water collar as shown in Figure 3.

3.3 Temperature Probe installation - Install the USB Temperature probe as shown in Figure 3

3.4 Rod & Collar - Install the Rod & Collar as shown in figure 3.

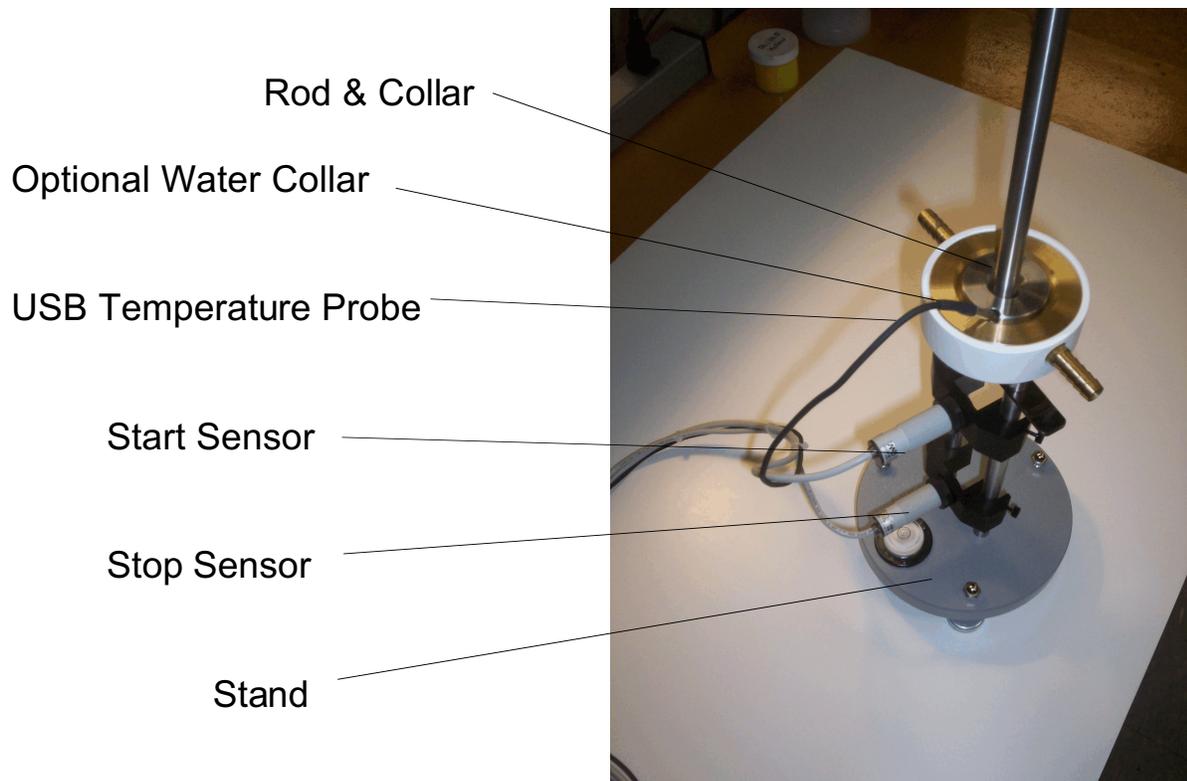


Figure 3 : Viscometer Stand components

4.0 Elapse Timer Set - up and Installation

4.1 Rod Sensors - Connect the round “Start” and “Stop” sensor connections to the connectors on the rear panel of the elapse timer as shown in Figure 4.

4.2 USB connection - Plug a standard USB cable (supplied) to the USB connector on the rear panel of the elapse timer as shown in Figure 4.

4.3 Power Connection - Connect the power cord to the power connector on the rear panel of the elapse timer as shown in Figure 4.

4.4 USB computer connections - When you have made the connections as described in steps 4.1 - 4.3 you will have 2 USB connections remaining. Plug both of these cables into the USB connections on your PC. This system is now ready to operate.



USB connections

USB connection

Start & Stop connections

Power connector

Figure 4: Elapse Timer details

5.0 Software Installation

5.1 Insert the CD ROM into the CD drive of your computer

5.2 Double click on "My Computer"

5.3 Double click on "Kershaw"

5.4 Double click on "SAV-09" folder

5.5 Double click on "setup" and follow the instructions.

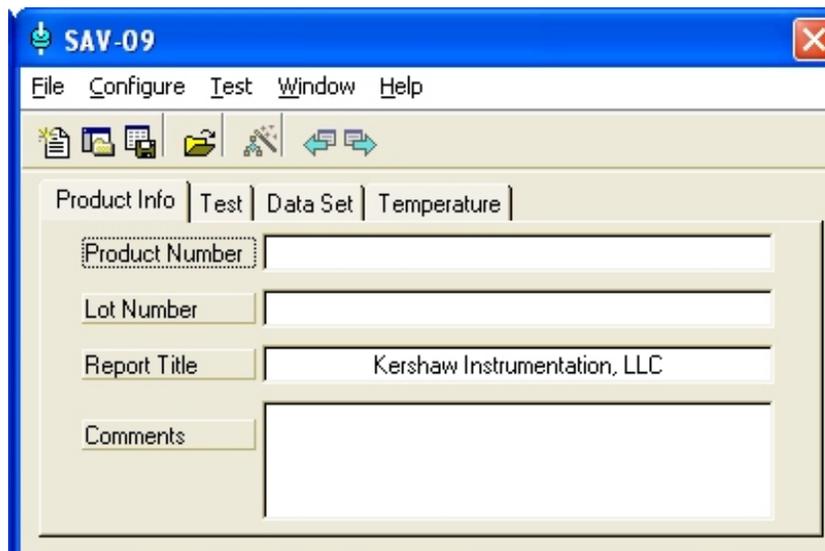
6.0 Software Project Settings

The software provided with this system allows the operator to enter and store “Project” information. These projects allow the operator to set up test procedures designed for their specific test requirements. Many of these projects may be entered, stored and used as desired.

Now we will look at the project settings. The project settings are entered via 4 “tabs” as in section 6.2. To clarify our discussion, let us use the following sample specification as we proceed.

6.1 Sample Specification:

- Use 3 drop weights = 100gram, 300 gram, 800 gram
- Use 4 drops per weight (total of 12 data points)
- Temperature compensation required
- Operating Temperature 23.0 ° C
- Abort test if the Temperature is out of spec ± 1.0 ° C
- Use the ASTM method to calculate the results
- Use Rod and Collar set number 123



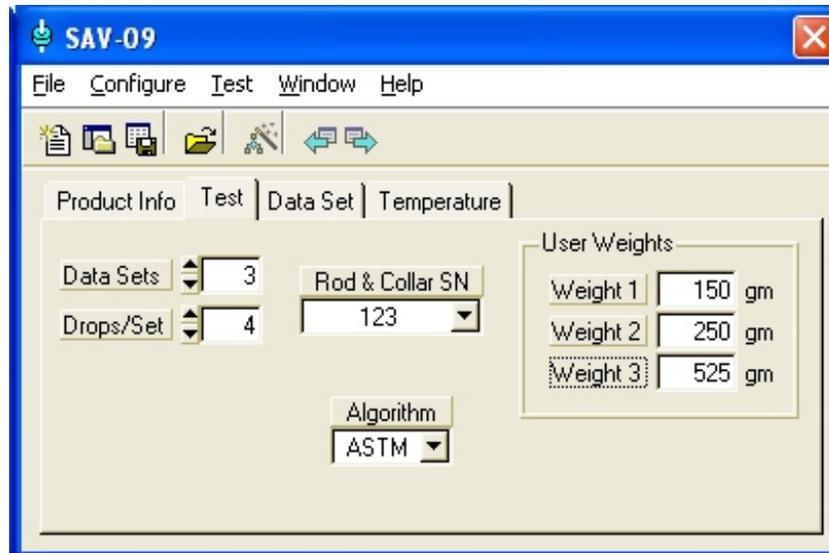
The screenshot shows a software window titled "SAV-09" with a menu bar (File, Configure, Test, Window, Help) and a toolbar. Below the toolbar are four tabs: "Product Info", "Test", "Data Set", and "Temperature". The "Product Info" tab is active, displaying a form with the following fields:

Product Number	
Lot Number	
Report Title	Kershaw Instrumentation, LLC
Comments	

6.2 Product Info Tab

6.2 “Product Info Tab”

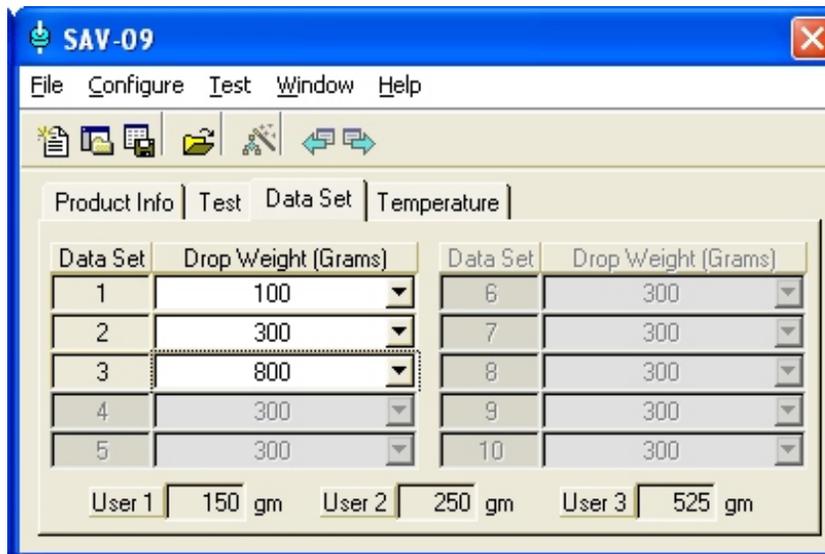
The “Product Info” tab allows the operator to enter Product number and Lot Number information. The “Report Title” will appear as the header on the test report that will be printed out after the test.



6.3 Test Tab

6.3 “Test Tab”

The “Test “ tab allows the operator to enter specific test parameters about the number of weights to be used (data sets) and the number of drops for each weight. In addition, this is where the Rod & Collar SN and the Algorithm are entered. Please see the explanation about the user weights in section 6.4.



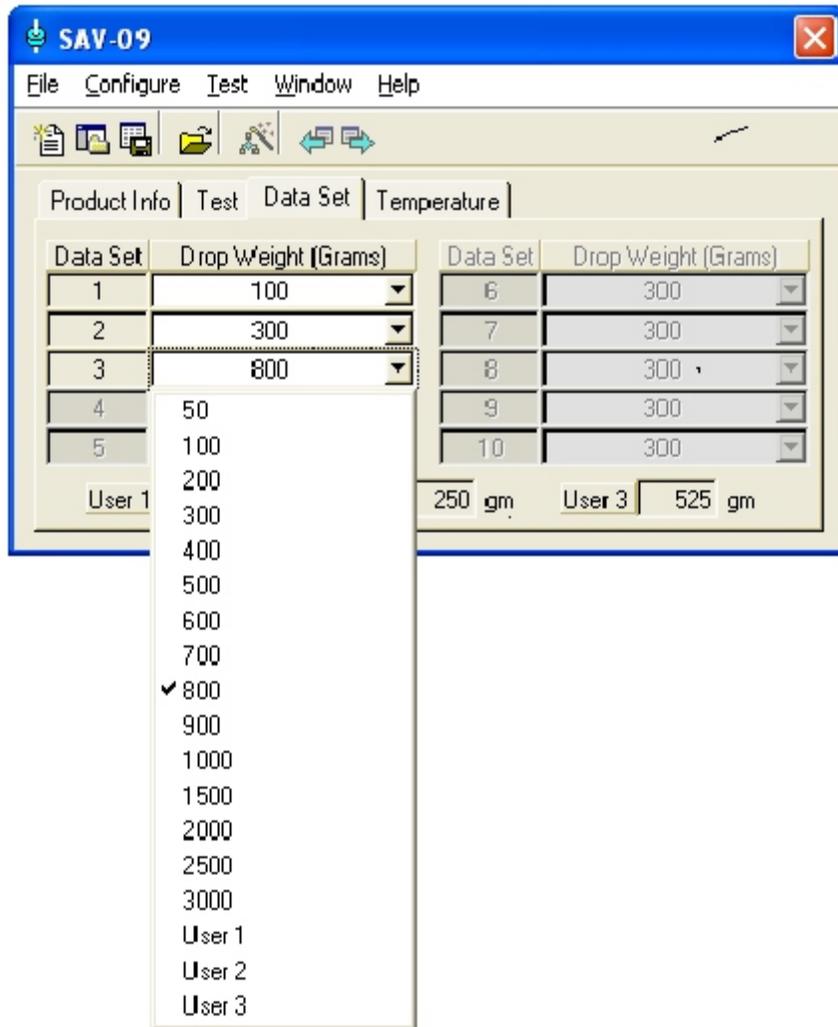
6.4 Data Set Tab

6.4 “Data Set Tab”

The “Data Set” tab allows the operator to enter the specified drop weight values. In this example we have entered the weight values from our sample specification. Please note that we had entered “3” in the Data Sets box on the Test Tab hence only 3 boxes are active in this area.

6.4.1 Drop Down menu for Weights

Below is an illustration of the drop down menu associated with the drop weights. All of the standard weights are included on this drop down menu.

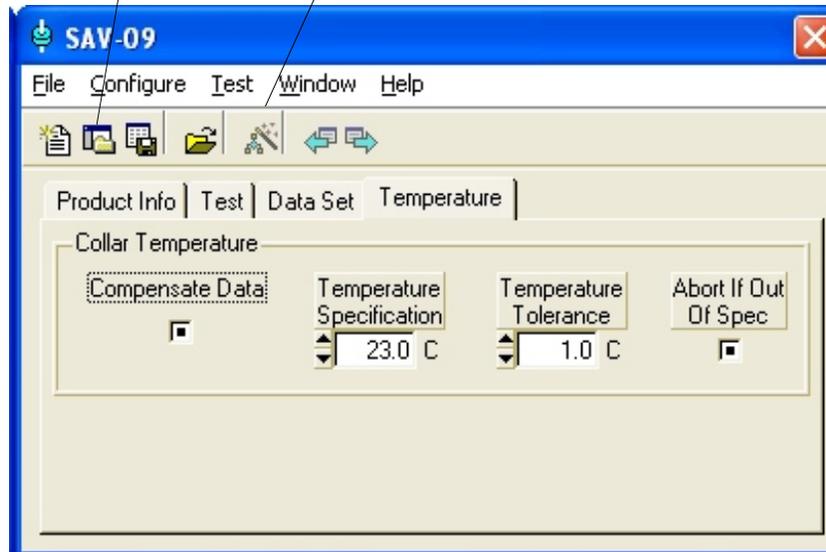


6.4.2 User Weights

Please note the three "Users Weights" entries at the bottom of the "Data Set" tab. These User weight entries are used for non standard weights. Any weight value can be entered into the "user weight" area. This feature is only used when a drop weight that is not included in the drop down menu is needed. Using our sample specification we do not need to use any of the user weights i.e. all of the weights in our sample specification are included in the drop down menu on the "Data Set" tab.

Save Project Icon

Start Test Icon



6.5 Temperature Tab

The "Temperature " tab allows the operator to enter the temperature specifications .

If the Compensate Data box is checked then the software will measure the collar temperature and compensate the data at each drop. If this box is unchecked it will simply assume that the temperature is steady state at the specified temperature i.e. no compensation .

If the Abort box is checked then the operator will be instructed to abort the test if the temperature is out of spec. If the operator continues with the test no data will be recorded.

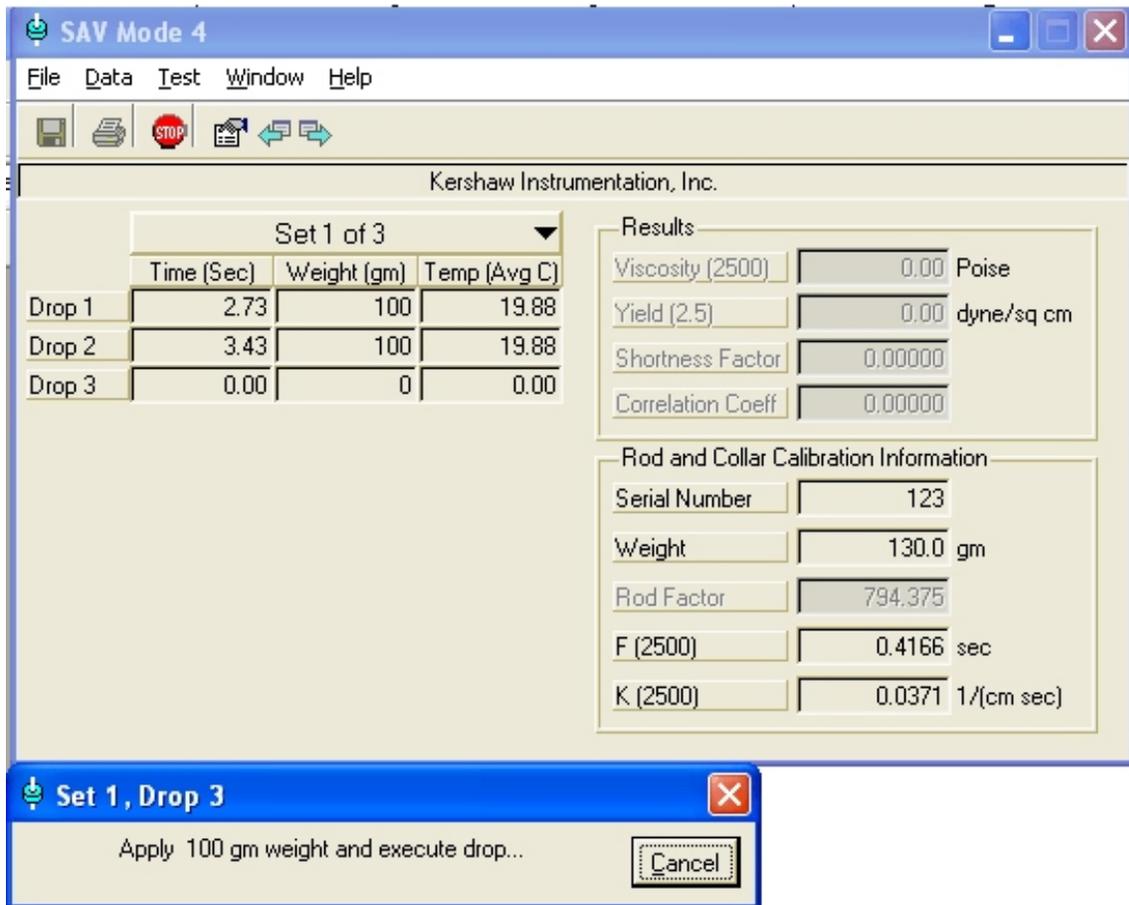
6.6 Saving a project

Now that all of the test parameters for this "project" have been entered , the operator will enter a name and save this project for future use. Click on the "Save Project" Icon as shown in figure 6.5.

7.0 Running a Test

When the test, is started, the software will walk the operator through each of the steps required to complete the test. During this sequence all of the time and temperature data will be taken automatically. Click on the “Start Test “ Click on the “Save Project” Icon as shown in figure 6.5.

7.1 Dropping the weight



The screenshot displays the SAV Mode 4 software interface. The main window shows a table of test results for 'Set 1 of 3' and a 'Results' section with various parameters. A dialog box is open at the bottom, prompting the user to 'Apply 100 gm weight and execute drop...' with a 'Cancel' button.

Set 1 of 3			
	Time (Sec)	Weight (gm)	Temp (Avg C)
Drop 1	2.73	100	19.88
Drop 2	3.43	100	19.88
Drop 3	0.00	0	0.00

Results

Viscosity (2500)	0.00	Poise
Yield (2.5)	0.00	dyne/sq cm
Shortness Factor	0.00000	
Correlation Coeff	0.00000	

Rod and Collar Calibration Information

Serial Number	123
Weight	130.0 gm
Rod Factor	794.375
F (2500)	0.4166 sec
K (2500)	0.0371 1/(cm sec)

Set 1, Drop 3

Apply 100 gm weight and execute drop...

Cancel

The software will instruct the operator to apply and drop the weight as shown above. Each time the weight is dropped the weight, fall time and temperature data will be recorded and displayed as shown above.

7.2 End of Test

When the final step is completed the software will generate a test report.

SAV-09 Test Report		test1			
<u>Product Information</u>					
Product Number:					
Lot Number:					
Graph Title:		Kershaw Instrumentation, Inc.			
Comment Field:					
Rod and Collar SN: 0					
Software Version: 1.00 Built: On Oct 04 2009					
<u>Test Results (Temperature Compensated)</u>					
Test Performed on:		Sun Oct 04 16:09:47 2009			
Test Algorithm:		ASTM			
Apparent Viscosity @ 2500 sec-1:		25.33 Poise			
Yield Stress @ 2.5 sec-1:		73292.53 Dynes/cm ²			
Shortness Factor:		2497.56020			
Correlation Coefficient:		NaN			
<u>Test Data (Set Averages)</u>					
Drop	Weight	Time	Temp	Shear Rate	Shear Stress
Number	(gm)	(Sec)	(C)	(Sec-1)	(Dynes/cm²)
0	300.000	8.00	25.7	0.0	0.0
1	700.000	4.87	25.7	0.0	0.0
2	1250.000	2.15	25.8	0.0	0.0
12/4/2009		Kershaw Instrumentation		1 of 1	

Sample Print Out

8.0 Calibration of “Rod Factor” for a Rod & Collar set:

You will need to acquire some data with a known calibration fluid in order for the software to calculate the “rod factor”. We recommend a “Cannon” or “Brookfield” calibration standard with known viscosity and temperature specification.

Next you will need to record the fall times using different weights. We recommend 3 drops at each of 5 weights, i.e. a total of 15 tests.

8.1 Build a “Project” for this calibration process - Refer to section 6 to build this project using 5 weights, 3 drops and the specified temperature.

8.2 Start the test and follow the instructions using the calibration fluid as your test specification.

9.0 First time “Rod Factor” calibration.

This system has a feature which will not allow the operator to use a Rod and collar until it has been calibrated. The first time you use this system you will not be able to enter data using the new rod and collar because it hasn't been calibrated yet, however you can't calibrate the rod and collar without data. To remedy this condition we have assigned a default rod and collar serial number “0” which has been assigned a rod factor of 1.00. This rod and collar set has been placed here so you can enter data upon start up in order to calibrate the system for the first time.

First you must go back into the “test” tab on the project menu (section 6.3) and select rod number 0. Now you can proceed to section 8.0 to calibrate with a standard viscosity fluid.

Once your calibration is complete, don't forget to return to the “test” tab and select the proper rod and collar set before you run any tests.

10.0 Additional Comments

10.1 Using multiple Rod & Collar sets

This system features a data base that will store the serial numbers of the Rod & Collar sets along with their respective rod factors. This will allow a customer to use multiple rod & collar sets with a single system. The operator simply selects the Rod & Collar SN being used on the “Test” tab and the proper rod factor will be assigned.

10.2 Data storage

In addition to printing the test report at the end of the test, the operator has the option to save the data for future use. This data set will be stored in a file that can be export to other applications if desired.