Operation Instructions

DV360™

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1. INTRODUCTION

When used with the Brookfield DV2T Viscometer, DV3T Rheometer, or DVNext Rheometer, DV360 can analyze data, generate multiple plot overlays, print tabular data, run math models and perform other time-saving routines. Other features and benefits of DV360 include:

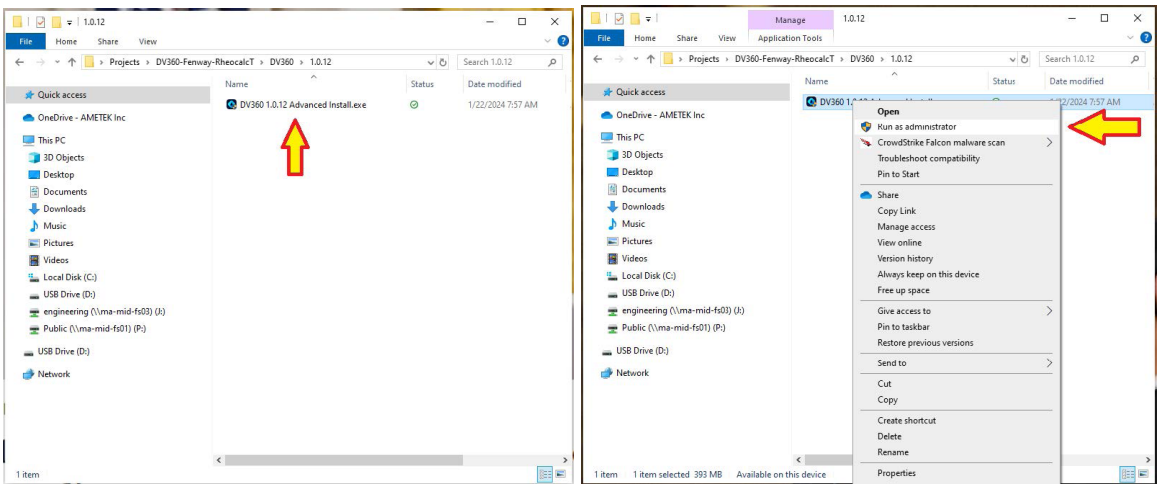
- Wizards and Test creation workflow steps to guide you through the creation of test methods, analysis, and reports.
- Secure 21 CFR, pt. 11 features including multiple logins, access levels, digital signatures, and data storage in a password-protected database (Advanced Edition only)
- Easy comparison of data and analysis
- Math models: Bingham, Casson, Casson NCA/CMA, Power Law, IPC Paste, Herschel-Bulkley
- Additional analysis: Gel Time, Curing, Yield Testing, Thix Index, Calibration verification
- Averaging of data

System Requirements	
Operating System:	Windows 10, Windows 11
Processor Speed:	3 GHz
RAM:	8 GB
Screen Resolution:	1920 x 1080 (Please note that using a lower screen resolution and/or a scale greater than 100%may require to the use of horizontal scroll bars in the display)
Communications:	One USB port; If using a temperature controller, an RS-232 port or USB converter is also required

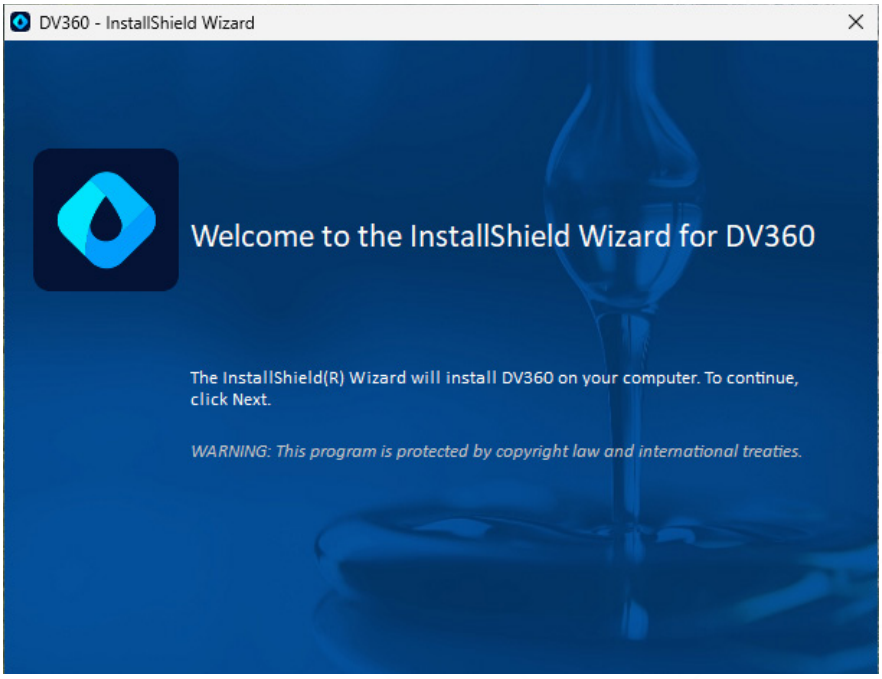
2. SOFTWARE INSTALLATION

DV360 installation is straightforward and is installed on a local computer. Please follow the instructions below to complete the installation.

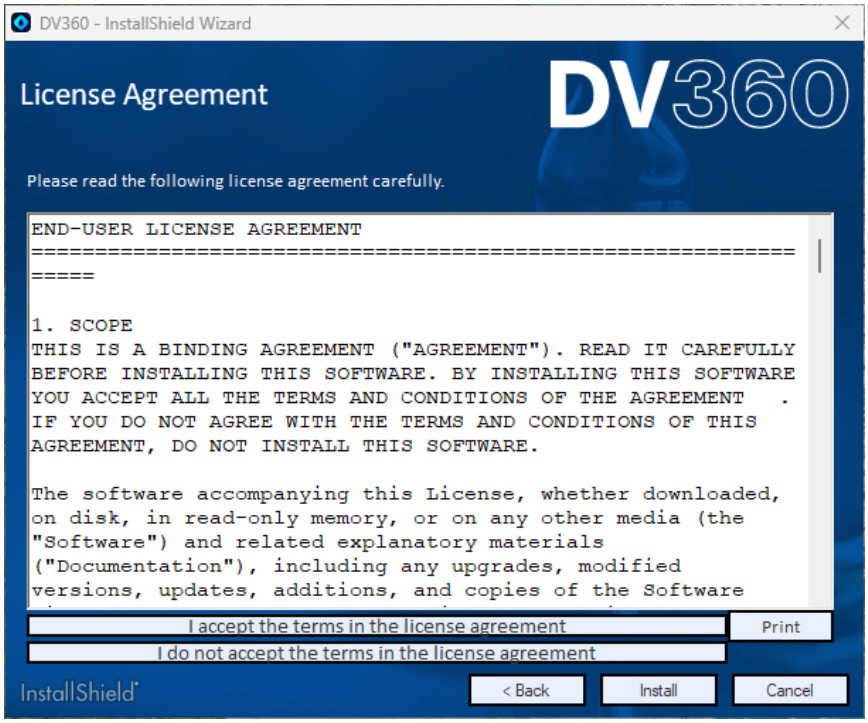
Open the DV360 exe file. Right-Click the mouse and select "Run as Administrator".



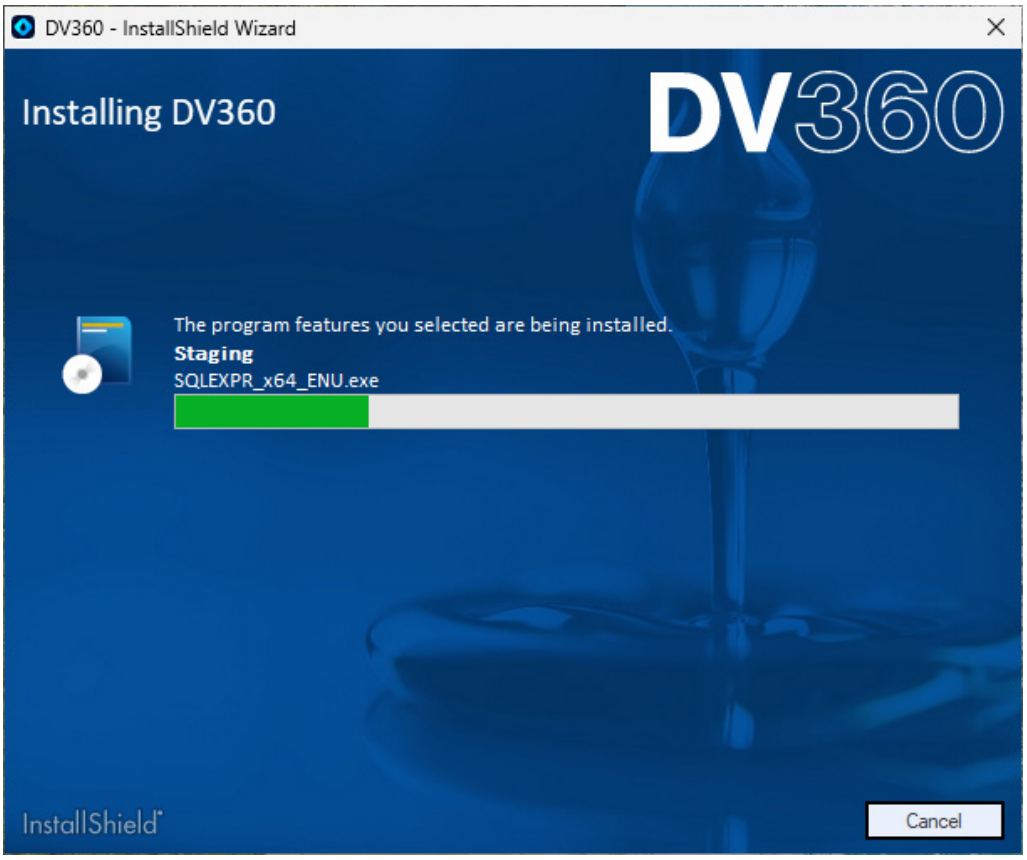
The Welcome screen will appear. Click Next to continue.

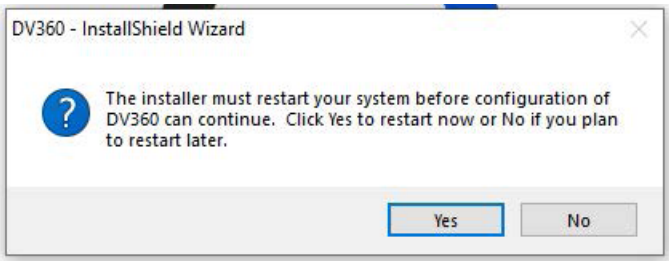


The License Agreement will come up. Review the license agreement, click 'I accept...', and click Install to continue.



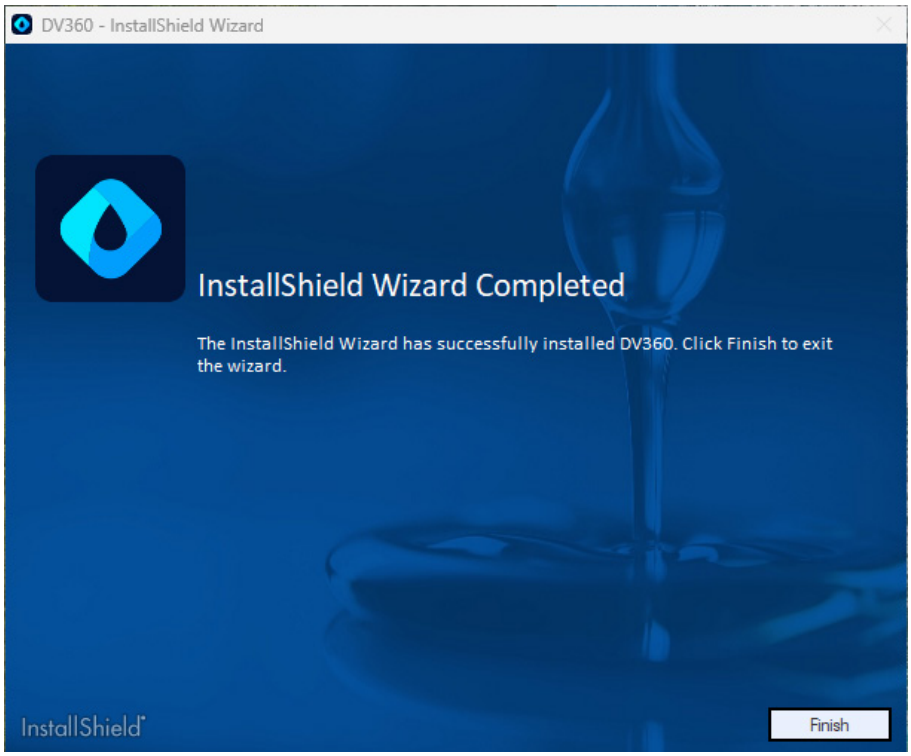
The installation may require that your computer be rebooted up to two times, depending on the configuration of your PC.





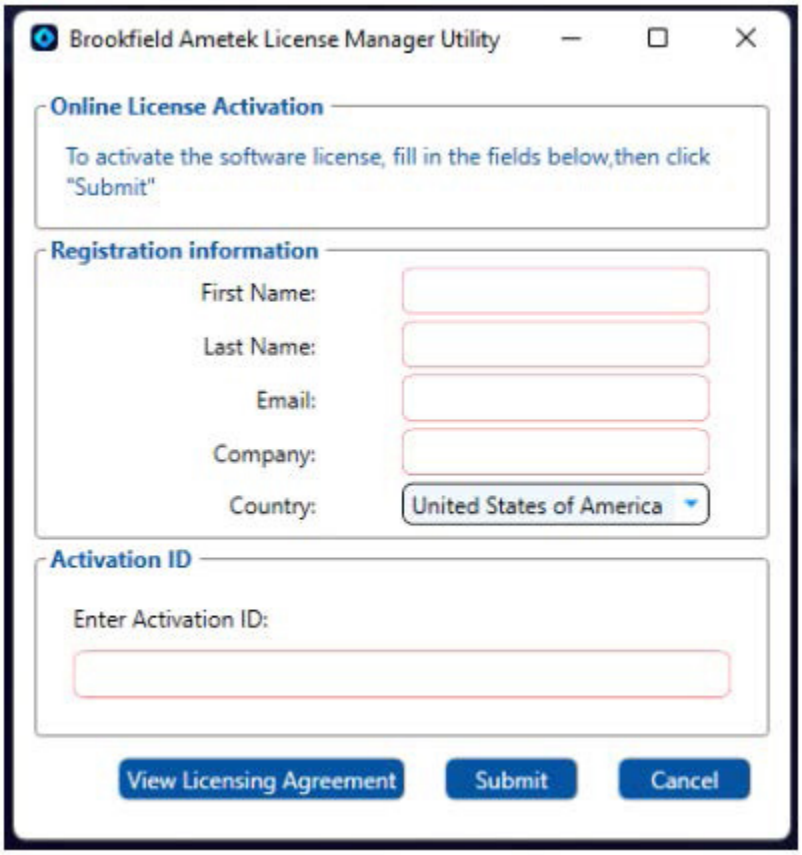
After rebooting, right-click on the DV360 Install file again and select 'Run as Administrator' to restart the installation
Wait for DV360 to install. This may take several minutes.

When the installation is finished, click the "Finish" button.



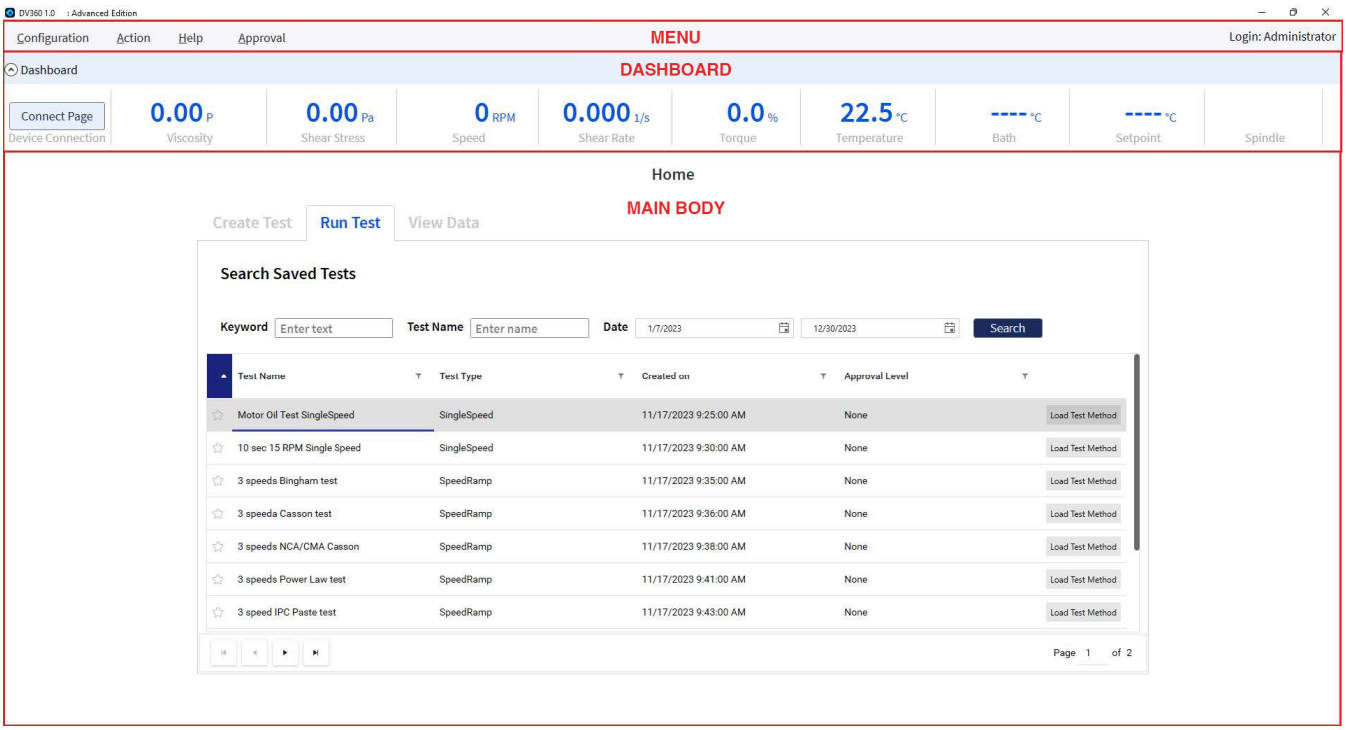
Activate your Software License.
The first time you start the software, you will be prompted to activate your license. To do so, Click "Activate Now" and fill in the required information to optimize your experience. Please note - If you are using a laptop which is regularly taken on and off of a docking station, activate the software while the laptop is OFF of the docking station.

If you have already opened the software without activating, go to the menu at the top of the screen and click Help > License Manager to activate.



If you have purchased the Advanced Edition of the software, it will require that you log in before it will start. The initial username is 'Administrator' and the initial password is 'admin'. You will be required to change this password (minimum of 4 characters) as soon as you log in.

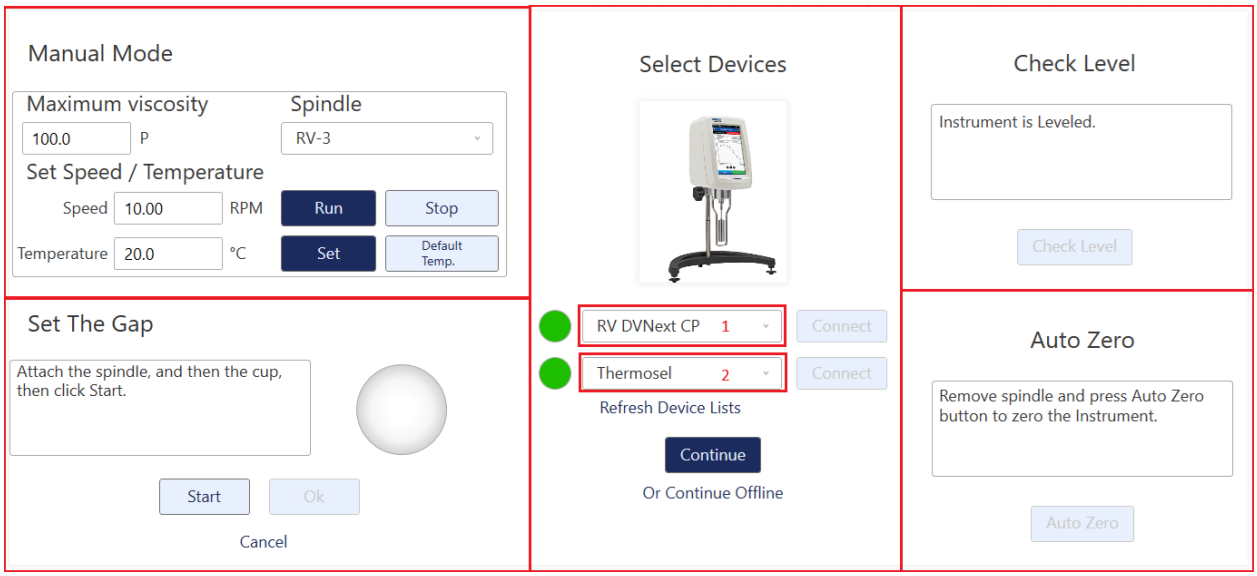
2.1 Software Layout



The DV360 software screen is made up of three elements:

1. The menu, which provides access to settings and utilities.
2. The dashboard, which shows continuous readings when the instrument is running.
3. The main body, where most tasks are set up and executed.

2.2 Connect to an Instrument or Temperature Controller



The "Connect" page is the first page the software will go to at startup. Here, you can connect to an instrument or a temperature controller.

To connect to an instrument:

1. Make sure the USB cable is connected to the computer and the instrument.
2. Turn the instrument on and set it to External mode.
3. Turn on the software, choose the instrument from the instrument drop down [1], and click "Connect".
4. If the software is turned on before the instrument is, click “Refresh Device Lists”, then proceed with step 3.

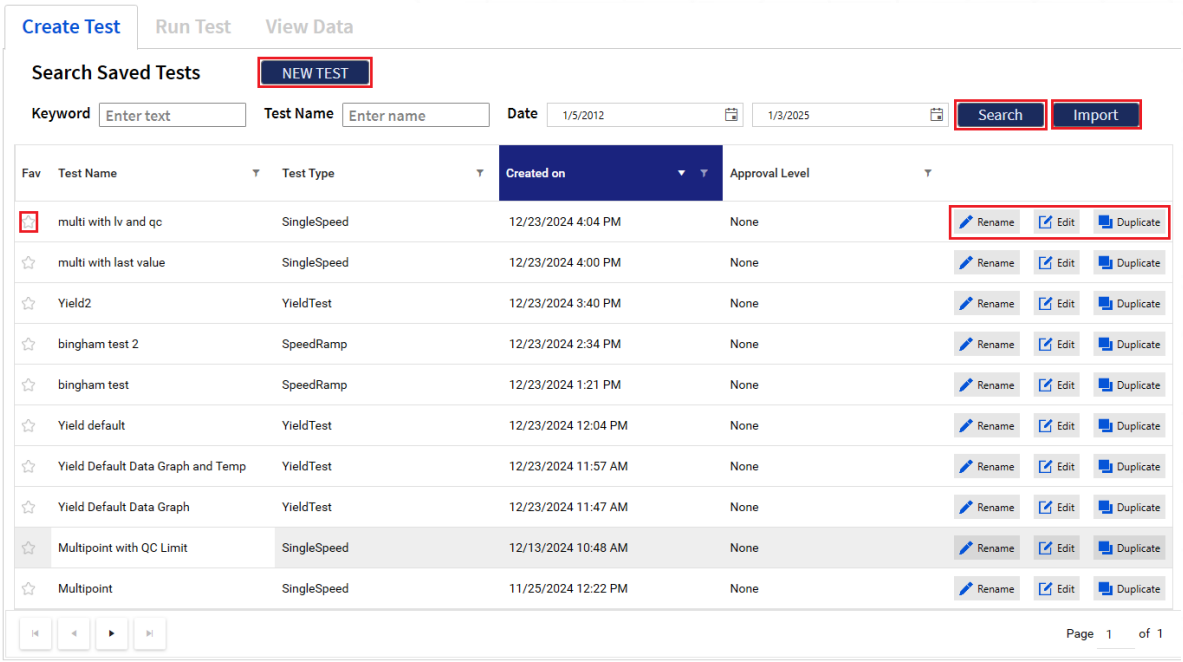
To connect to a temperature controller (if applicable):

1. Make sure the RS-232 cable is connected to the computer and the temperature controller.
2. Turn the temperature controller on and set it to Remote mode.
3. Turn on the software, choose the instrument from the instrument drop down [2], and click "Connect".
4. If the software is turned on before the temperature controller is, click “Refresh Device Lists”, then proceed with step 3.

Once the instrument is connected, you can carry out several preliminary steps before beginning testing:

1. Check Level: to check if the instrument is level, click the “Check Level” button.
2. Auto Zero: To Auto Zero the instrument, remove any spindle and click the “Auto Zero” button.
3. Gap Setting: For Cone/Plate instruments, you can set the gap by following the instructions in the “Set The Gap” section.
4. Manual Mode: You can run the instrument at a speed and run the temperature controller at a temperature without starting a test. When running at a speed, the maximum viscosity for that speed/spindle combination is displayed.

2.3 Home Page



The Home page is the central page where all tasks begin, and where the software returns to when a user completes any task.

The Home page consists of three search grids (one for creating a test, one for running a test, and one for viewing data), where the user can choose the test method or dataset they want to work with. In each of the search grids, the user can sort or filter on each column. They can also enter a keyword and/or date range and click "Search" to find a test method or dataset.

The user can also import a test or dataset by clicking the Import button on the Create Test or View Data pages. Tests and datasets can be imported from other DV360 databases, as well as from DVT instruments and the Rheocalc T software."

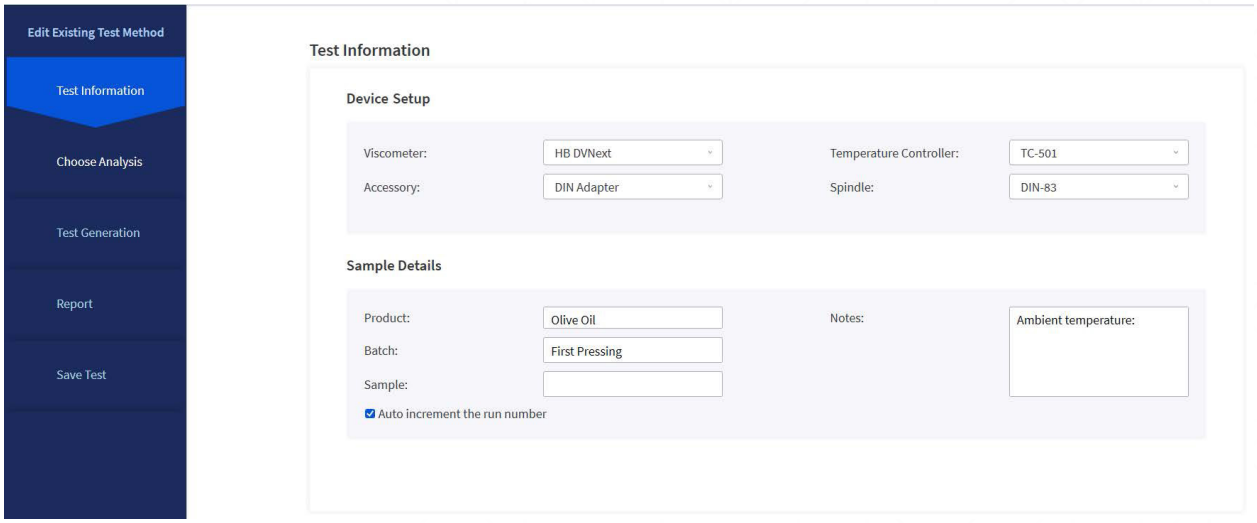
The "Create Test search grid" also has additional features:

- To create a new test method instead of editing an existing one, the user can click the "NEW TEST" button.
- The user can mark a test method as a favorite by clicking the star next to its name. The first column can then be sorted to bring the favorite test methods to the top of the list.
- The user can click the buttons on the right side of the grid to rename a test method, open a test method to view or edit it, or make a duplicate of the test method.

3. CREATE A TEST

To begin the test creation process, on the 'Create Test' tab of the Home Page , the user can click the 'New Test' button or choose an existing test from the list and click "Edit". The software proceeds to the "Create Test" page.

3.1 Enter Device Setup and Sample Details



The Test Information page is used to specify what devices are intended to be used with this test, as well as any default sample identification.

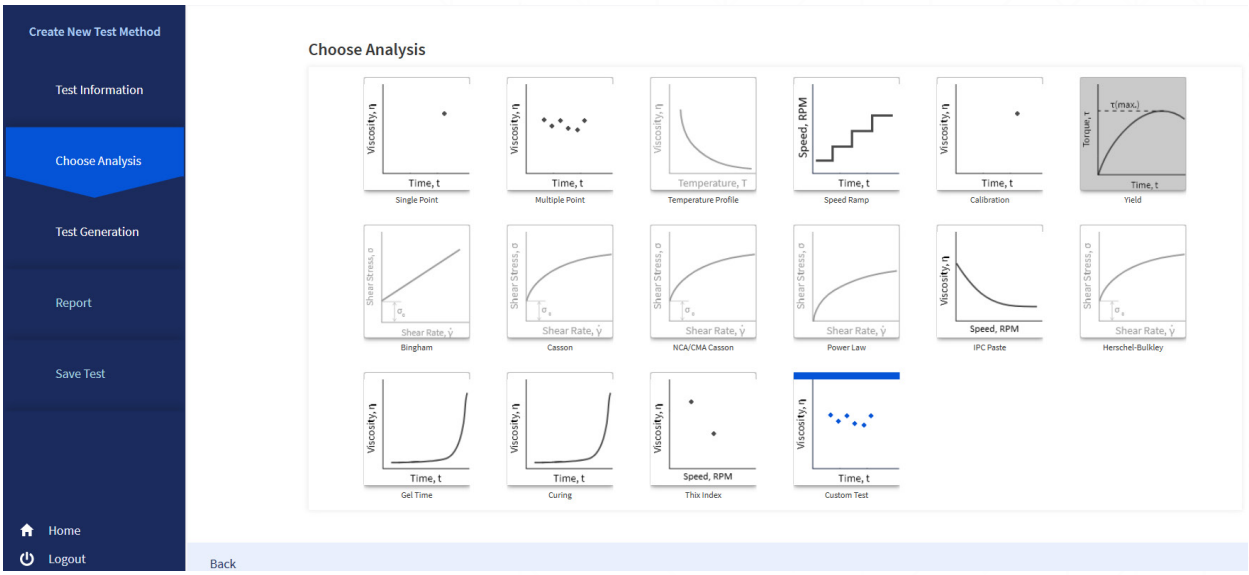
In the Device Setup section, the user chooses what viscometer, accessory, spindle, and temperature controller will be used with this test. Note that these device choices will affect what choices are available in the next "Create Test" pages. If the user chooses the V-71, V-72, or V-73 spindle, they will also be able to specify whether the spindle will be immersed to the secondary mark (See 4.4 Yield Test Type and Analysis). For example, if the Temperature Controller is left as ‘None’, on the Test Generation page the temperature control option will be disabled.

In the "Sample Details" section, the user can specify any default sample information. The information entered here is what the tester will see each time in the "Preview Test" page just before starting a test run (Preview the Test before running). The tester will be able to adjust the sample infomation, for example to enter the unique sample name, before running the test. Entering Sample Details information at test creation time is optional.

Some use cases for default sample information:

- If this test method will always be used with the same product, the user can set the product name at test creation time, so that the tester does not need to enter it before each test run. This also helps the tester verify that they are using the correct test for their sample.
- Default notes text can be set up at test creation time. This "Notes" text will appear before each test run, prompting the tester to enter the requested information.
- If the user knows the tester will be doing more than one test run on the same Product/Batch/Sample, the user can check “Auto Increment the run number”. This will cause the Run Number to be appended to the Sample name, to insure that each dataset is uniquely identified.

3.2 Choose Analysis & Generate the Test

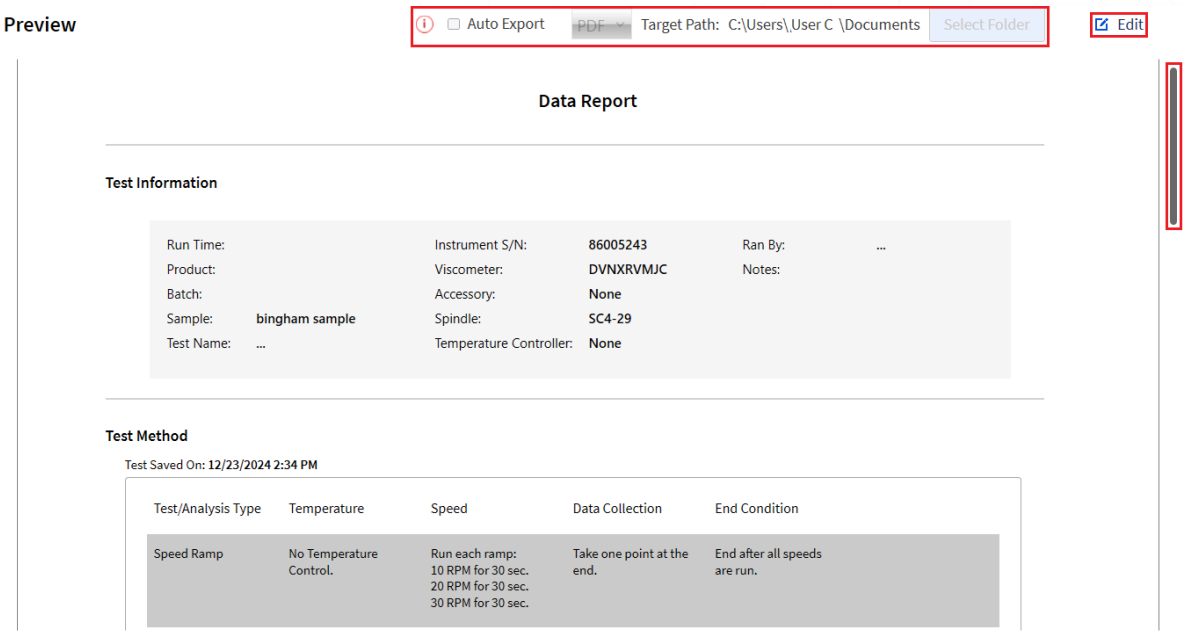


After "Enter Device Setup" and Sample Details, the user indicates what type of analysis they want to do. The software sets up the required test type and default settings according to the analysis tile chosen.

The following topics describe the different test types which can be set up and the analysis which is available for each test type:

1. See **Single Speed Test Type and Analysis for**:
   - Single Point Analysis
   - Multiple Point Analysis
2. See **Temperature Profile Test Type for**:
   - Temperature Profile Analysis
3. See **Speed Ramp Test Type and Analysis for**:
   - Speed Ramp Analysis
   - Bingham Analysis
   - Casson Analysis
   - NCA/CMA Casson Analysis
   - Power Law Analysis
   - IPC Paste Analysis
   - Herschel-Bulkley Analysis
4. See **Calibration Test Type and Analysis for**:
   - Calibration Analysis
5. See **Yield Test Type and Analysis for**:
   - Yield Analysis
6. See **Gel Time Test Type and Analysis for**:
   - Gel Time Analysis
7. See **Curing Test Type and Analysis for**:
   - Curing Analysis
8. See **Thix Index Test Type and Analysis for**:
   - Thix Index Analysis
9. See **Custom Test Type and Analysis for**:
   - Custom Test

3.3 Review the Report



The Report includes all pertinent information about the test run and the data collected:

- The Test Information section lists the time that the test was run, the sample identification, and the devices used for the test.
- The Test Method section lists the details of the test that was run.
- The Data Graph section plots all collected data points.
- The Data Table section lists all collected data points.
- The Analysis section displays results of analysis performed on the collected data. The analysis shown is dependent on the test type and the settings chosen.

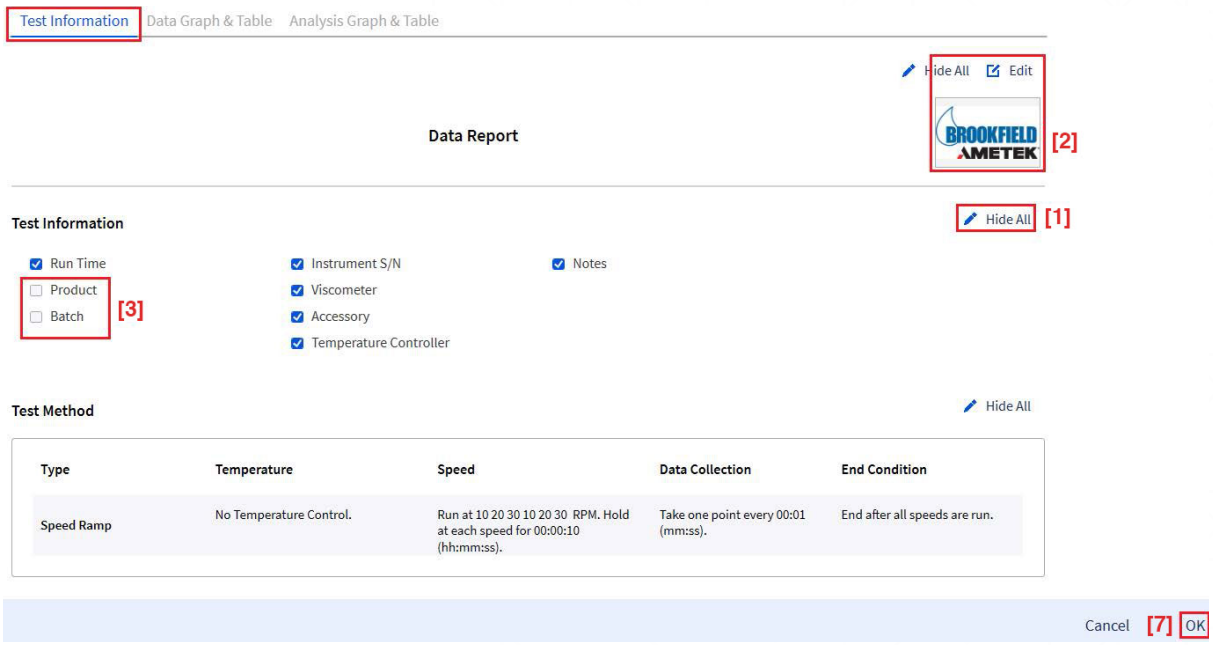
Use the scrollbar on the right side of the report to view all the different sections.

To customize the report, click the Edit button in the top right corner above the preview (see Choose Report Layout and Settings). This preview shows the report as it will appear in a printout or PDF export. Note that for CSV and XLSX exports, the same data will shown in approximately the same layout, but graphs will not be included.

The user can choose to automatically export the data report at the end of each test run. This is done by checking the Auto Export checkbox, choosing the export file type, and choosing the folder that the data reports will be saved to. Note that "Auto increment the run number" option must be set up on the Test Information page in order to use Auto Export

3.4 Choose Report Layout and Settings

When the user clicks the "Edit" button in the top right corner above the Report Preview (Review the Report), the "Report Edit" screen will come up. The following describes the settings which can be changed in the Report Edit tabs:



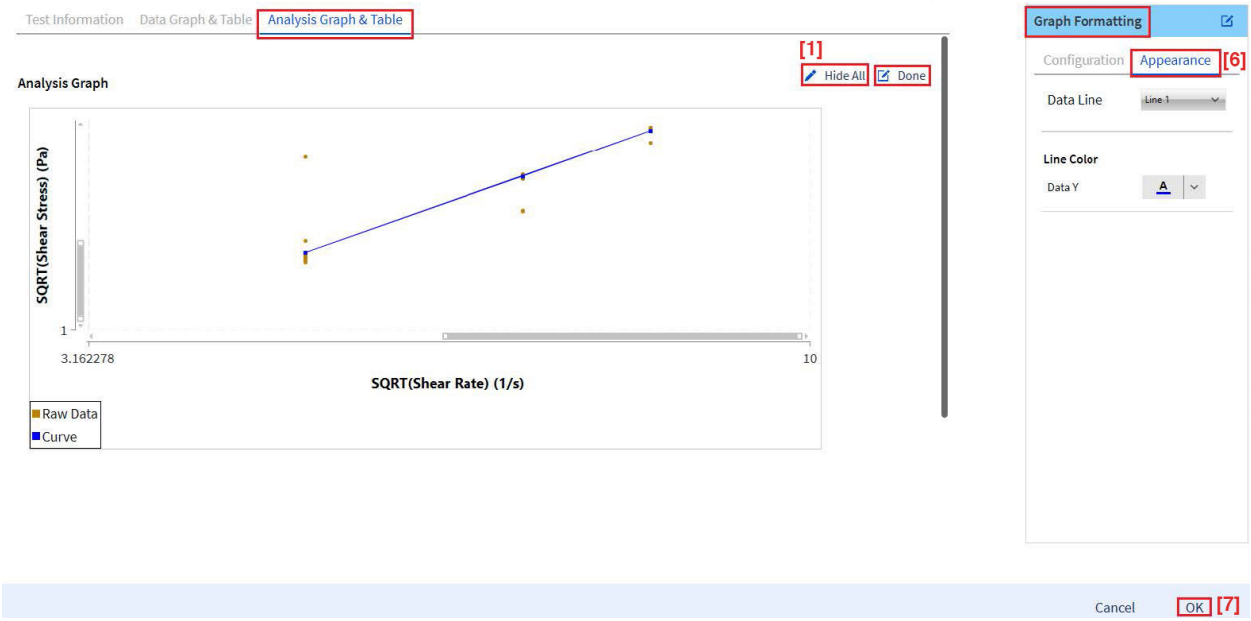
Test Information Edit tab:

- On all of the edit tabs, clicking the 'Hide All' [1] next to each section will hide that section within the report.
- The user can upload a logo [2] by clicking the "Edit" button just above the logo box. This "Edit" button also allows the user to edit the report title.
- In the "Test Information" section of this tab, the user can uncheck fields which they do not use [3], so that the field label does not appear on the report.
- Once you are done editing the report layout, click OK [7] to save the changes and return to the Report "Preview".

Data Graph & Table Edit tab:

- On all of the edit tabs, clicking the 'Hide All' [1] next to each section will hide that section within the report.
- The user can choose which parameter (Viscosity, Time, etc) should be displayed on each graph axis [4].
- If the user clicks the "Edit" button in the top right corner of this tab, it will open the "Graph Formatting" panel. The "Configuration" tab [5] on this panel gives the user scaling options for the graph, while the "Appearance" tab [6] gives options for each line within the graph.

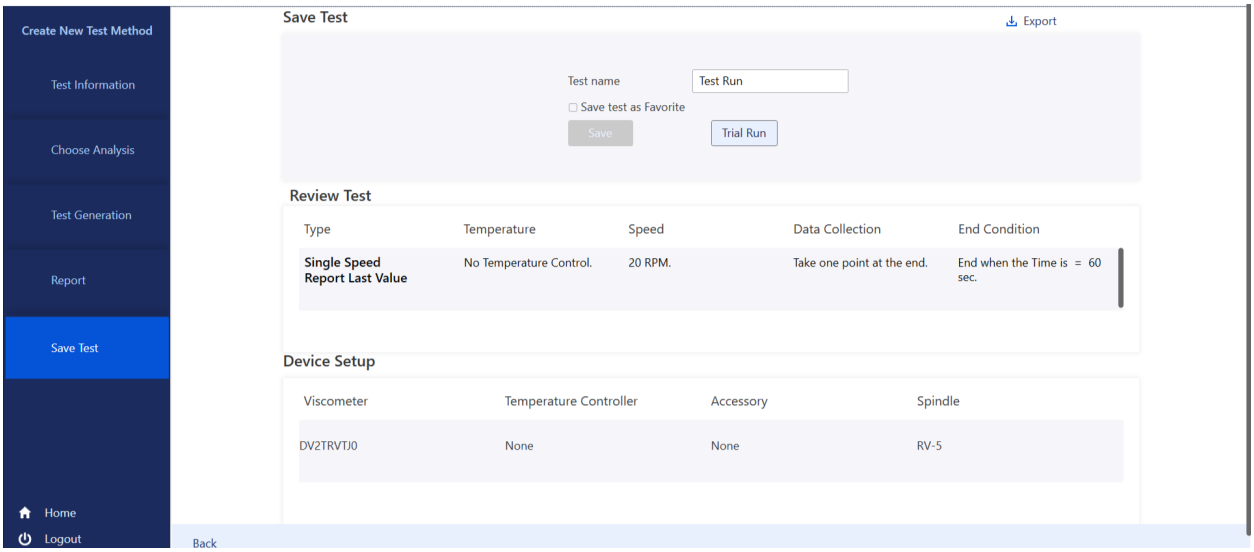
- Once you are done editing the report layout, click "OK" [7] to save the changes and return to the Report Preview.



Analysis Graph & Table Edit tab:

- On all of the edit tabs, clicking the 'Hide All' [1] next to each section will hide that section within the report.
- If there is an Analysis graph, clicking the "Edit" button in the top right corner of this tab will open the "Graph Formatting" panel. The "Configuration" tab [5] on this panel gives the user scaling options for the graph, while the "Appearance" tab [6] gives options for each line within the graph.
- Once you are done editing the report layout, click "OK" [7] to save the changes and automatically return to the Report Preview.

3.5 Save the Test

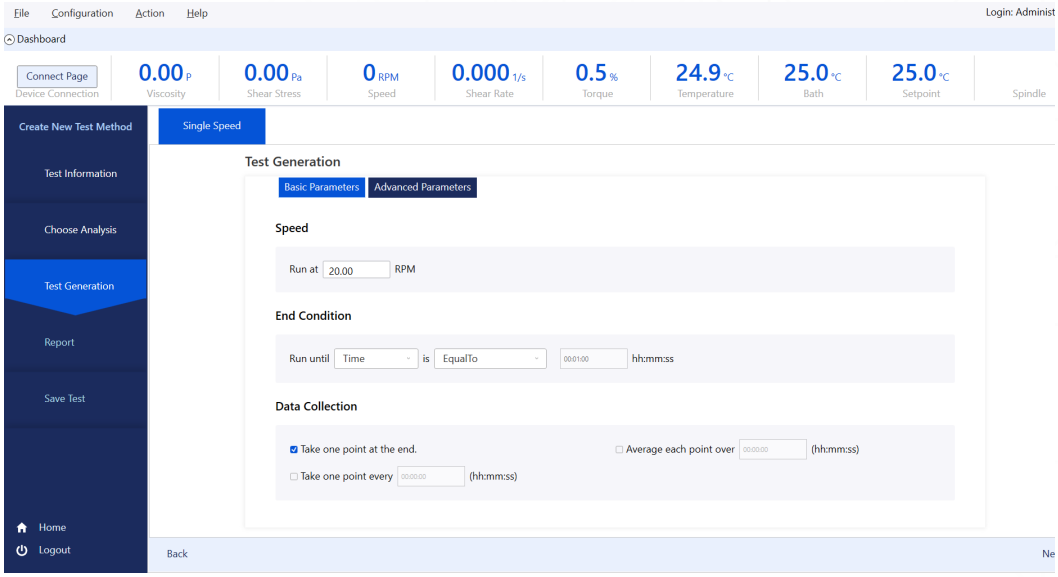


On the "Save Test" page, the user reviews the test parameters and saves the test. The "Review Test" section gives a summary of the test parameters. The user can also click back on any previous tab to review more details about the test parameters.

To save the test method, the user enters the name of the test and clicks "Save". After the test has been saved, the user has the option to immediately start a test run by clicking ‘Trial Run’.

4. TEST TYPES

4.1 Single Speed Test Type and Analysis



The "Single Speed" test type is used collect data at a single speed. This test type can use a great variety of conditions to determine when the test should end.

The test will run at the specified speed. One data point can be collected at the end of the test, or data points can be collected at a regular interval during the test run.

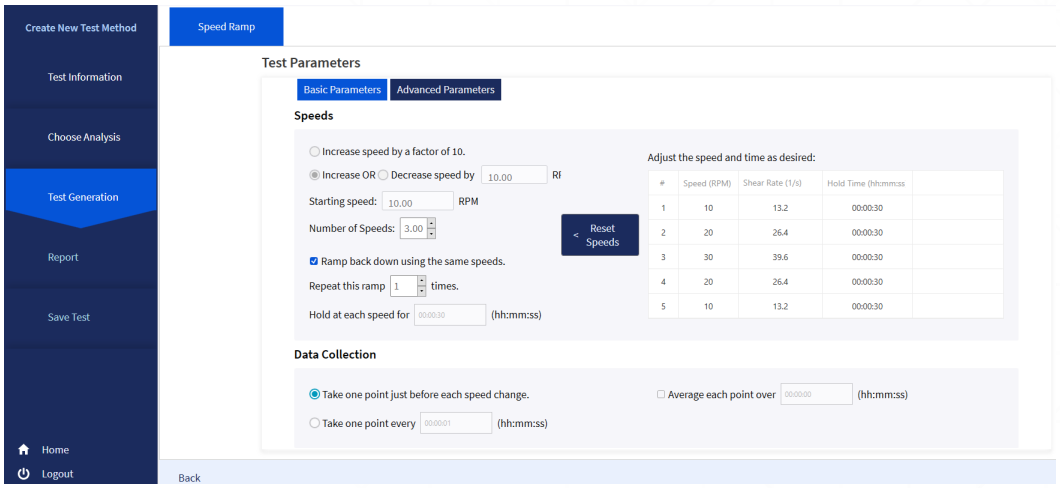
For the end condition, the user can choose between Time, # of Points, # of Revolutions, Torque, Viscosity, or Temperature. Torque, Viscosity, or Temperature can be set to equal a value, be greater or lesser than a value, or wait for the value to stabilize. The Temperature end condition can also be set to wait until the value peaks. The test will continue to run until the end condition is met.

On the "Advanced Parameters" tab, the user can choose to set up optional temperature control. This requires that a temperature controller be connected to the software. The user can specify what temperature must be reached before the test can be run. They can also specify whether the sample must stay at this temperature for a certain period of time (“soak”) before running the test.

QC Limits can be set for any of the following fields: Shear Stress, Temperature, Time, Torque, or Viscosity. The QC limits will be marked on the Data Graph. Values which are outside the QC limits will be highlighted in red within the Data Table.

The user also has the option to choose analysis to perform on the data. There is an option to report the final value of a specified field. If multiple data points are collected, statistics (min/max/average/standard deviation) can be calculated across those points.

4.2 Speed Ramp Test Type



The "Speed Ramp" test type is used to collect data at several different speeds. This test can be run without any analysis, or the data collected can be analyzed using a math model (see below).

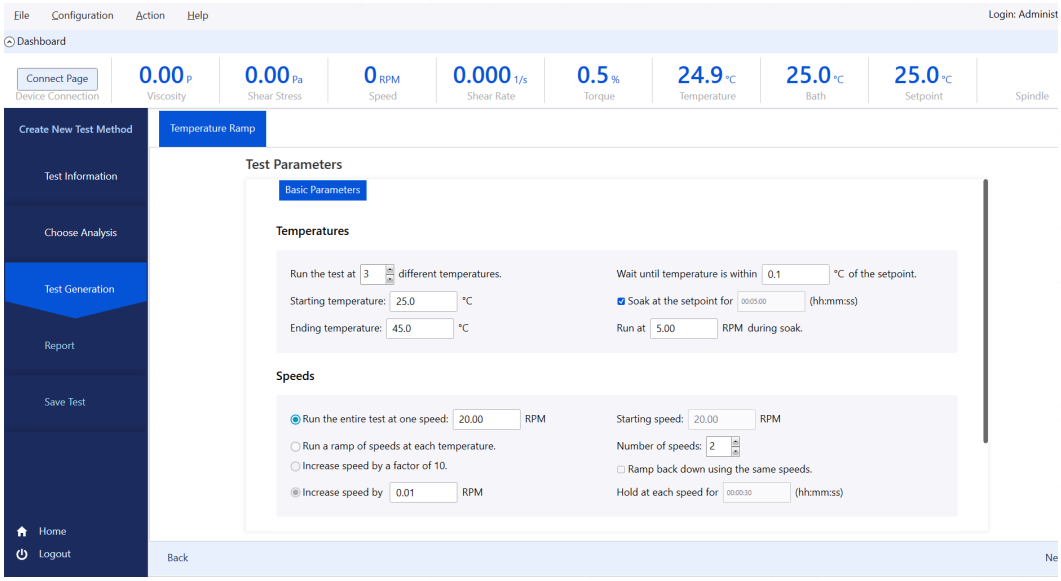
The speed ramp is set up by choosing the starting speed, specifying how much to increase for each additional speed, and setting how many speeds to run in total. The user can also choose whether the ramp should repeat. The Hold time determines how long the test will remain at each speed before moving on to the next speed. Once the settings are chosen, click the "Generate Speeds" button to generate the list of speeds which will be used. The user can adjust the Speed or Shear Rate they want to test at. Note that changing either of these fields will cause the other field to be recalculated. The user can also adjust how long to hold at each speed. One data point can be collected at each speed, or data points can be collected at a regular interval during the test run.

On the "Advanced Parameters" tab, the user can choose to set up optional temperature control. This requires that a temperature controller be connected to the software. The user can specify what temperature must be reached before the test can be run. They can also specify whether the sample must stay at this temperature for a certain period of time (“soak”) before running the test.

On the "Advanced Parameters" tab the user also has the option to choose a math model for data analysis. Note that the math models require the use of a spindle with an SRC value greater than 0. The following math models are available:

- Bingham Math Model
- Casson Math Model
- NCA/CMA Casson Math Model
- Power Law Math Model
- IPC Paste Math Model
- Herschel-Bulkley Math Model

4.3 Temperature Profile Test Type



The "Temperature Ramp" test type is used to collect data over a range of temperatures. This test requires that a temperature controller be connected to the software.

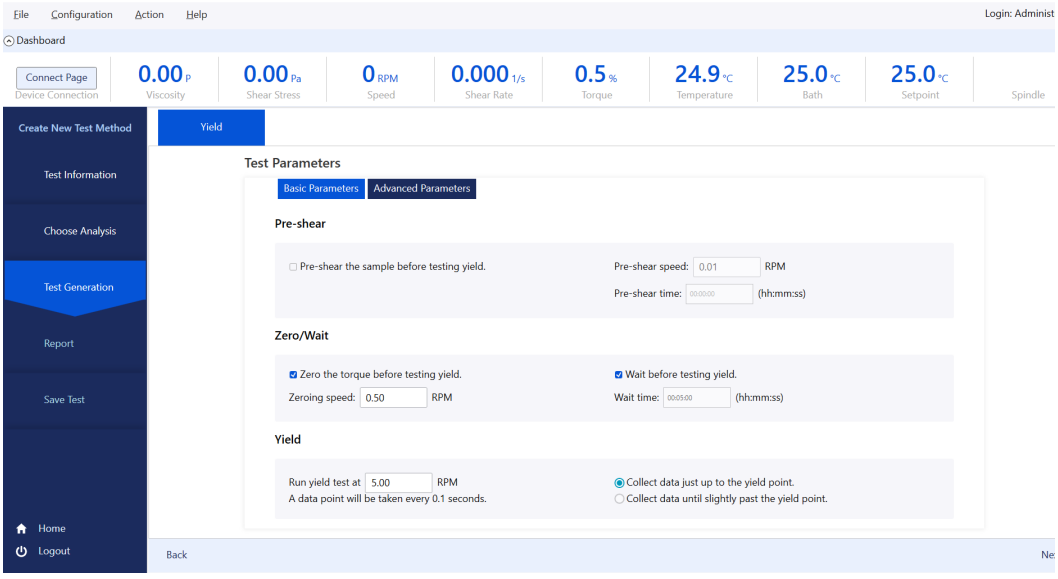
The temperature ramp is set up by choosing the starting temperature, the ending temperature, and the total number of temperatures to run at. The user can also specify whether the sample must stay at this temperature for a certain period of time (“soak”) before running the speed step(s).

The entire test can be run at one speed, or a ramp of speeds can be run for each temperature. The speed ramp can be set up by choosing the starting speed, specifying how much to increase for each additional speed, and setting how many speeds to run in total. The user can also choose whether the ramp should repeat. The "Hold time" determines how long the test will remain at each speed before moving on to the next speed.

One data point can be collected at each temperature/speed change, or data points can be collected at a regular interval during the test run.

Note that there is no additional analysis done on data collected with this test type.

4.4 Yield Test Type and Analysis



The Yield test type is used to measure the static yield value of a visco-elastic material. This test requires the use of a "Vane spindle".

Note that vane spindles V-71, V-72, V-73 have secondary immersion marks. Normally, the vane spindle should be inserted so that the sample reaches the primary immersion mark located on the spindle shaft. If the sample container is too small to allow the spindle to be inserted to this mark, this secondary immersion mark, located half way down the blades of the vane spindles, may be used. If the secondary immersion mark will be used, it should be noted when that spindle is chosen (see 3.1 Enter Device Setup and Sample Details).

The user can set up several optional preparatory steps before the yield step. The "Pre-Shear" step will rotate the spindle at the specified speed for the specified time. The "Zero step" will slowly rotate the spindle in each direction until a zero torque reading is achieved. The "Wait step" will wait for the specified period of time, with no spindle rotation.

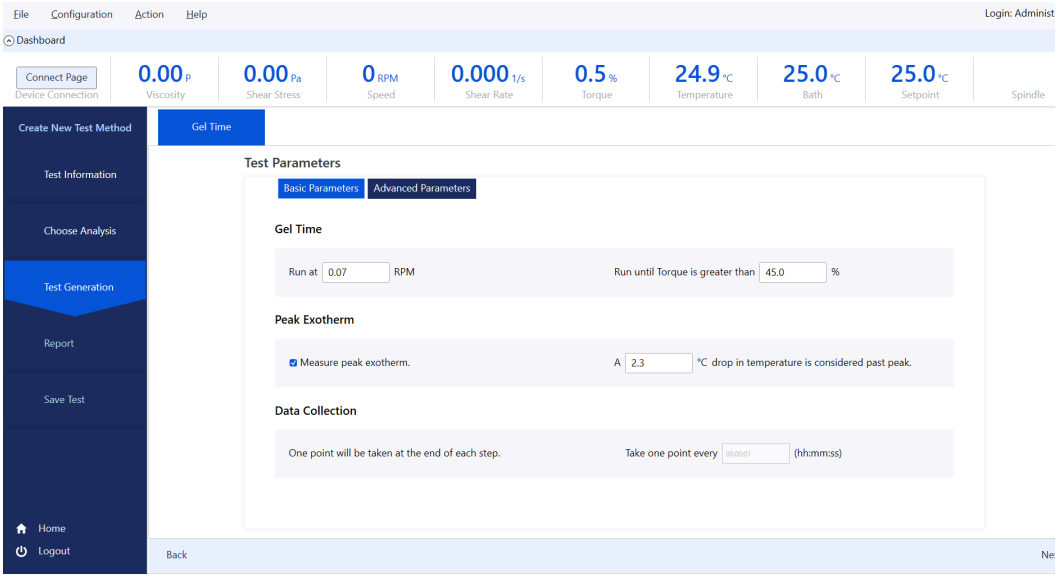
The "Yield step" will run at the specified speed, taking 10 points per second. This step will run just until yield is achieved or to slightly past the yield point.

On the "Advanced Parameters" tab, the user can choose to set up optional temperature control. This requires that a temperature controller be connected to the software. The user can specify what temperature must be reached before the test can be run. They can also specify whether the sample must stay at this temperature for a certain period of time (“soak”) before running the test.

The Stress QC Limits can be set. The QC limits will be marked on the Data Graph. Values which are outside the QC limits will be highlighted in red within the Data Table. The user can also choose whether the Analysis Graph displays Torque vs Time or Stress vs Strain.

This test type will analyze when yield occurs. It will show an Analysis Graph of the yield curve, and it will report the Yield Stress and the Torque at Yield.

4.5 Gel Time Test Type and Analysis



The "Gel Time" test type (using spindle GT-45) is used to test properties of materials which gel.

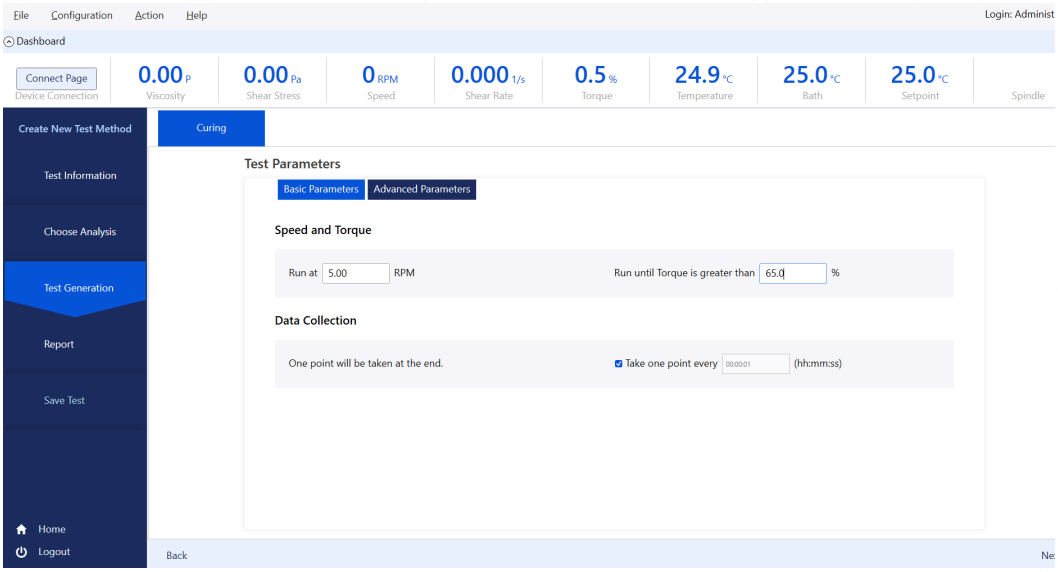
The user sets the speed the test should run at, and the torque at which the material is considered gelled. Optionally, the user can also choose to measure the peak exotherm. If the peak exotherm option is not chosen, the test will stop when it reaches the specified torque. If the peak exotherm option is chosen, the test will continue past that torque and end after the material has reached its highest temperature.

On the "Advanced Parameters" tab, the user can choose to set up optional temperature control. This requires that a temperature controller be connected to the software. The user can specify what temperature must be reached

before the main part of the test can be run. They can also specify whether the sample must stay at this temperature for a certain period of time (“soak”) before moving on to the main part of the test.

This test type will report the time at which the test reached the specified torque (Gel Time). If the Peak Exotherm option is chosen, this test will also report highest temperature the material achieved (Peak Exotherm).

4.6 Curing Test Type and Analysis



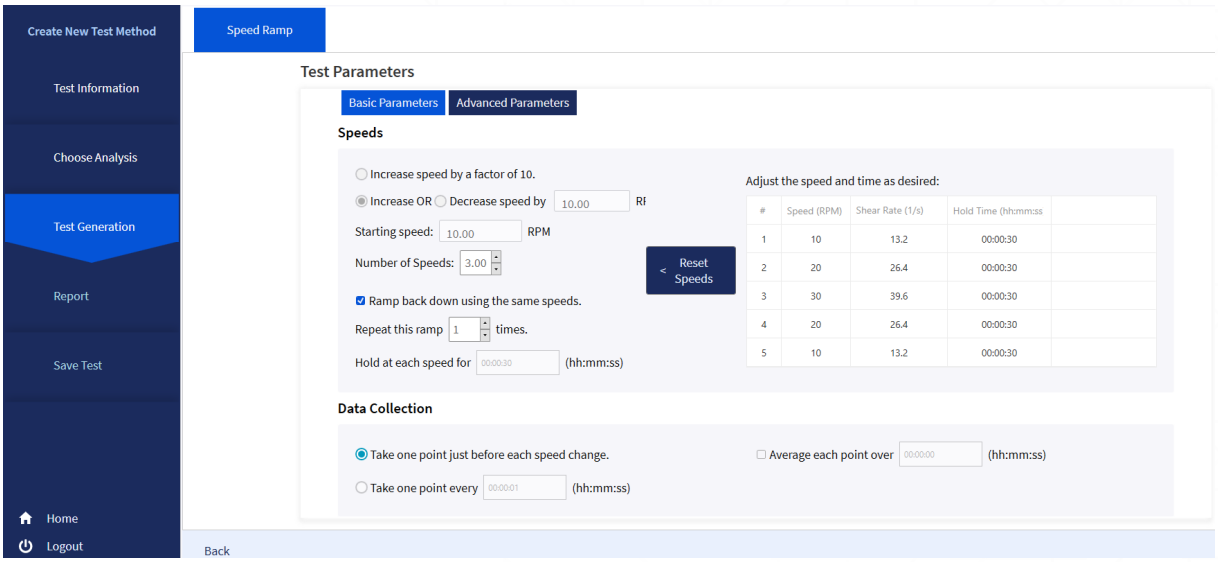
This test type is used to set up a simple test for materials that cure.

The user sets the speed the test should run at, and the torque at which the material is considered cured. The test will run until the specified torque is reached. One data point will be taken when this torque is reached. The user can also choose to take data points at regular intervals throughout the test.

On the "Advanced Parameters" tab, the user can choose to set up optional temperature control. This requires that a temperature controller be connected to the software. The user can specify what temperature must be reached before the test can be run. They can also specify whether the sample must stay at this temperature for a certain period of time (“soak”) before running the test.

This test will report the time at which the specified torque was reached (Curing Time).

4.7 Thix Index Test Type and Analysis



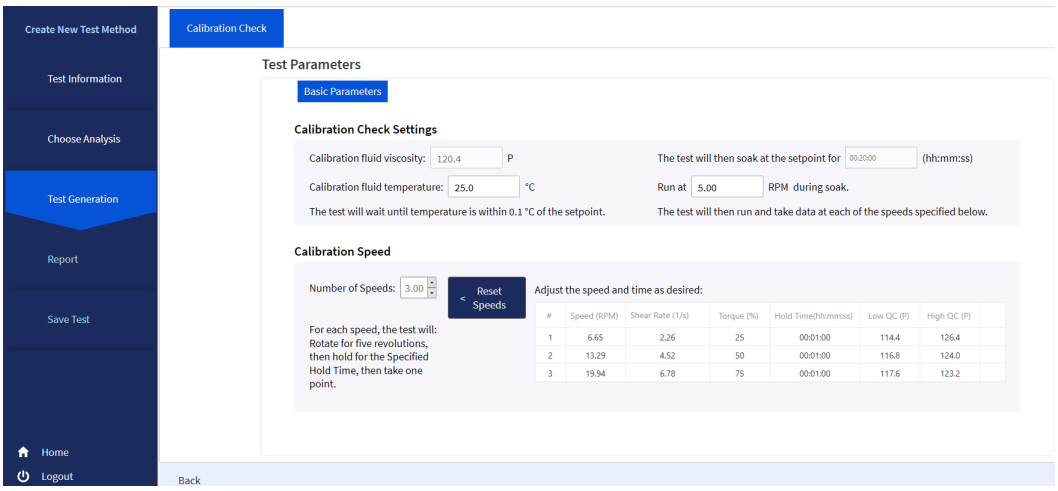
The "Thix Index" test type is used to get the Thix Index, which is an indication of a liquids shear sensitivity.

The "Thix Index" test requires measurements taken at two different speeds. The user chooses the starting speed, then chooses how much to increase to get the second speed. The "Hold time" determines how long the test will remain at each speed before moving on to the next speed. One data point will be collected at each speed.
On the "Advanced Parameters" tab, the user can choose to set up optional temperature control. This requires that a temperature controller be connected to the software. The user can specify what temperature must be reached before the test can be run. They can also specify whether the sample must stay at this temperature for a certain period of time (“soak”) before running the test.

This test will calculate the Thix Index:

Thix Index = (Viscosity at low speed) / (Viscosity at high speed)

4.8 Calibration Test Type and Analysis



The Calibration Check test type is used to check the calibration of your viscometer. This test type requires that a temperature controller be connected to the software. It also requires that you have a certified calibration fluid.

Enter the viscosity of the calibration fluid you will be using, as well as the corresponding temperature. Enter how long the test should wait after reaching the setpoint, to insure thermal equilibrium ("soak"). You can also specify the speed

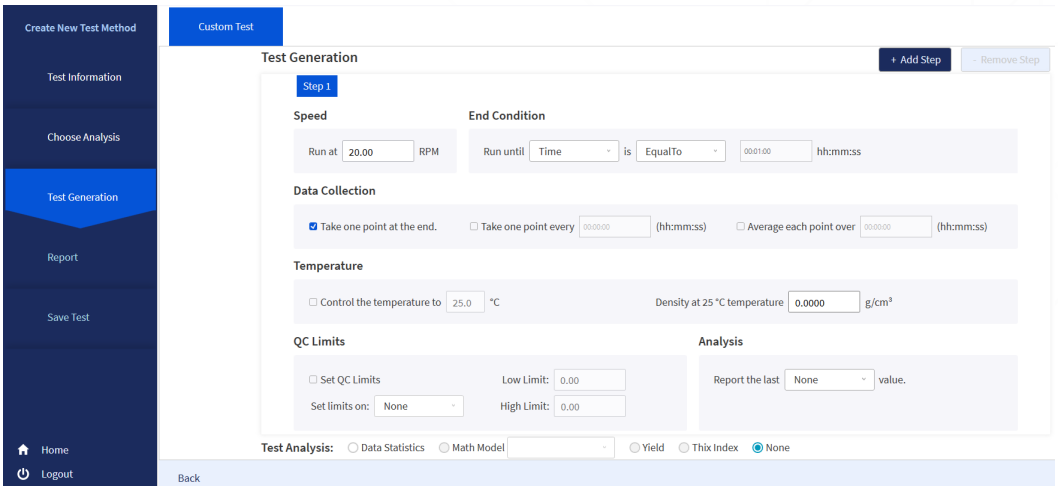
to run at during the Soak step.

Next choose how many speeds to run the calibration at (1-5) and click the "Generate Speeds" button. The software will automatically space out the speeds to cover the instrument's torque range. The user can adjust the %Torque, Speed, or Shear Rate they want to test at. Note that changing any one of these fields will cause the other fields to be recalculated. The user can also adjust how long to hold at each speed.

When this test is run, the software will set the temperature controller to the specified temperature and wait until that temperature is reached. It will then remain at that temperature for the specified Soak time, to insure complete thermal equilibrium. After this, for each calibration speed, the software will rotate the spindle for 5 revolutions, hold for the specified time, then take a calibration check data point.

The acceptable higher and lower viscosity reading limits are calculated for each calibration check speed and listed in the test summary. If the viscosity of any calibration check data point is outside of its acceptable limits, it will be listed in the Analysis section of the data report.

4.9 Custom Test Type



The Custom test type allows the user to set up a highly customized test. For this test type, the user can set up one or more steps, each of which can use a great variety of conditions to determine when the step should end. Steps can be added or removed using the buttons in the top right-hand corner of this page.

Each step will run at its specified speed. For each step, one data point can be collected at the end, or data points can be collected at a regular intervals. If a temperature controller is chosen in the Test Information page, for each step the user can choose to control to a specified temperature.

For each step end condition, the user can choose between Time, # of Points, # of Revolutions, Torque, Viscosity, Temperature, Zero, or Yield. Torque, Viscosity, or Temperature can be set to equal a value, be greater or lesser than a value, or wait for the value to stabilize. The Temperature end condition can also be set to wait until the value peaks. The Yield end condition runs until the material yields ('Achieved') or just past this point ('Surpassed'). The Zero end condition causes the spindle to slowly rotate back and forth until 0% Torque is reached. The Zero end condition is used in conjunction with the Yield end condition.

Other test types restrict the test stucture to meet the requirements for the chosen analysis. For the Custom test type, however, the user must set up the test structure correctly if they want to perform a specific analysis. For example, if the user wants to perform Bingham math model analysis on the data collected with their Custom test, they need to define multiple steps which collect data at different speeds, as well as choosing a spindle with SRC>0 in the Test Information page. When this is set up, the Math Model radiobutton will become available. The user can then check the Math Model radiobutton and select Bingham from the dropdown list of math models.

The test will continue to run until all of the steps are complete, then perform any chosen analysis.

5. MATH MODELS

5.1 Bingham Math Model

The Bingham equation is: $\tau = \tau^\circ + \eta D$

where:

τ = shear stress
τ° = yield stress (shear stress at zero shear rate)
η = plastic viscosity
D = shear rate

The calculated parameters for this model are:

- Plastic Viscosity (P or Pa·s)
- Yield Stress (Dynes/cm² or N/m²)
- Confidence of fit (%)

A plot of shear stress versus shear rate is displayed for this model.

5.2 Casson Math Model

The Standard Casson equation is: $\sqrt{\tau} = \sqrt{\tau^\circ} + \sqrt{(\eta D)}$

Where:

τ = shear stress
τ° = yield stress (shear stress at zero shear rate)
η = plastic viscosity
D = shear rate

The calculated parameters for this model are:

- Plastic Viscosity (P or Pa·s)
- Yield Stress (Dynes/cm² or N/m²)
- Confidence of fit (%)

The Standard Casson method is a direct implementation of the original Casson equation. A plot of the square root of shear stress versus the square root of shear rate is displayed for this model.

5.3 NCA/CMA Casson Math Model

This Casson method is derived from the standard set forth by the National Confectioners Association (NCA) and the Chocolate Manufacturers Association (CMA). Although based on the original Casson equation, this implementation has been tailored by the NCA and CMA specifically to applications involving chocolate.

The Chocolate Casson equation is: $(1+a)\sqrt{\tau} = 2\sqrt{\tau^\circ} + (1+a)\sqrt{(\eta D)}$

Where:

τ = shear stress
τ° = yield stress (shear stress at zero shear rate)
η = plastic viscosity
D = shear rate

a = spindle (or bob) radius / inner cup radius

The calculated parameters for this model are:

- Plastic Viscosity (P or Pa·s)
- Yield Stress (Dynes/cm² or N/m²)
- Confidence of fit (%)

A plot of (1 + a) times the square root of shear stress versus (1 + a) times the square root of shear rate is displayed for this model.

5.4 Power Law Math Model

The Power Law equation is: $\tau = kD^n$

Where:

τ = shear stress
D = shear rate
k = consistency index
n = flow index

The calculated parameters for this model are:

- Flow Index (no units)
- Consistency Index (P or Pa·s)
- Confidence of fit (%)

A plot of the log of shear stress versus the log of shear rate is displayed for this model.

5.5 IPC Paste Math Model

This method, based on the Power Law equation, is intended to calculate the Shear Sensitivity Factor and the 10 RPM Viscosity value of pastes. A prime example of its use is in the solder paste industry, thus the name IPC (Institute for Interconnecting and Packaging Electronic Circuits).

The Paste equation is: $\eta = kR^n$

Where:

η = viscosity (cP)
k = consistency multiplier
R = rotational speed (RPM)
n = shear sensitivity factor

The calculated parameters for this model are:

- Shear Sensitivity Factor (no units)
- 10 RPM Viscosity(cP or mPa·s)
- Confidence of fit (%)

A plot of the log of viscosity versus the log of speed (RPM) is displayed for this model.

5.6 Herschel-Bulkley Math Model

The Herschel-Bulkley equation is: $\tau = \tau^\circ + kD^n$

Where:

τ = shear stress
τ° = yield stress (shear stress at zero shear rate)

$\mathbf{D}$ = shear rate
$\mathbf{k}$ = consistency index (cP)
$\mathbf{n}$ = flow index

The calculated parameters for this model are:

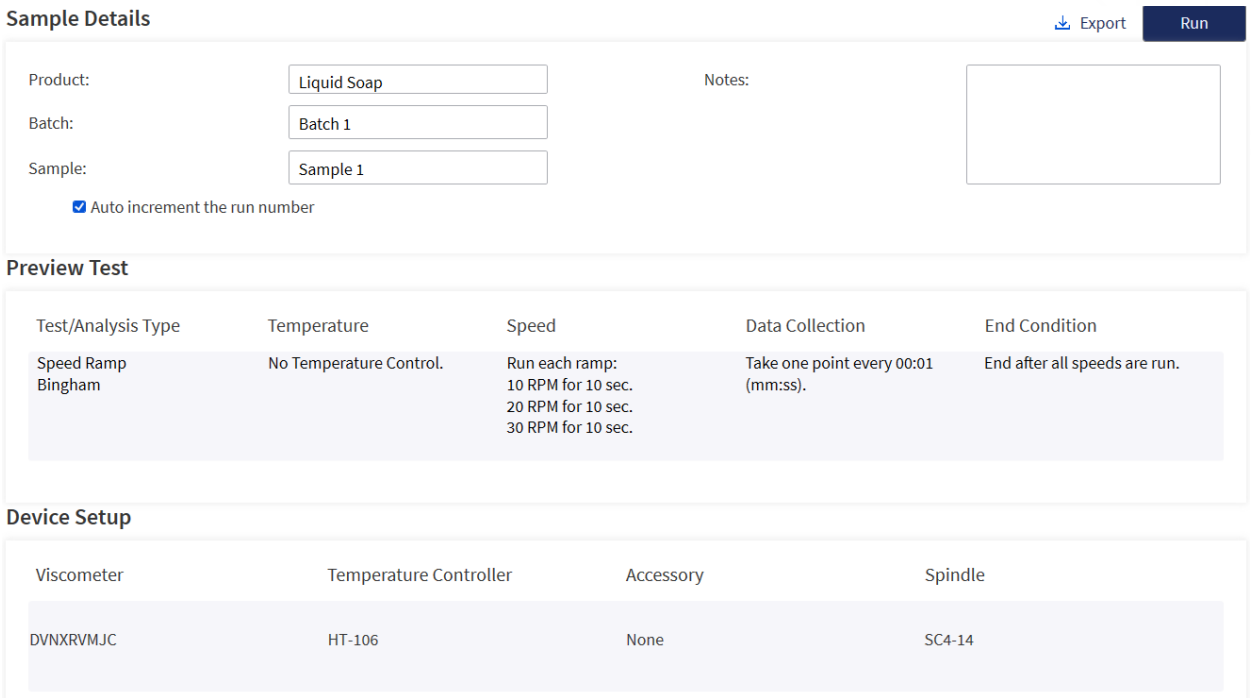
- Flow Index (no units)
- Consistency Index (cP or mPa·s)
- Yield Stress (Dynes/cm2 or N/m2)
- Confidence of fit (%)

A plot of the log of (shear stress - yield stress) versus the log of shear rate is displayed for this model.

6. RUN A TEST

To begin the run test process, on the ‘Run Test’ tab of the Home Page, the user can choose an existing test from the list and click ‘Load Test Method’. The user previews the test about to be run, then the software proceeds to the "Run Test" page.

6.1 Preview the Test before running



When the user loads a test method from the ‘Run Test’ tab of the Home Page, the test method is displayed on the Preview Test page (pictured above), for the user to review before running. On this page the user can make any necessary changes to the sample name or notes. They can review the test settings. They can also review the device setup, and ensure that the devices intended for this test have been set up and connected. Note that if a viscometer is not connected, the "Run" button will be disabled. The user can also export the test method to various file formats.

6.2 During the Test Run

During a test run, the Test Status line (across the top of the page) provides information about where the test is in its execution. The Test Status shows whether the test is running, how long it has been running, what step the test is in, and when that step will end. The test may have one or more steps, depending on whether it was set up to run at multiple speeds, or reach a certain temperature before continuing, etc.

Note that during the test run, most other software controls are disabled. This ensures that no other operation interferes with the test execution and data collection.

7. VIEW DATA

On the "View Data" tab of the Home Page, the user can select one dataset to view, or select several datasets to compare.

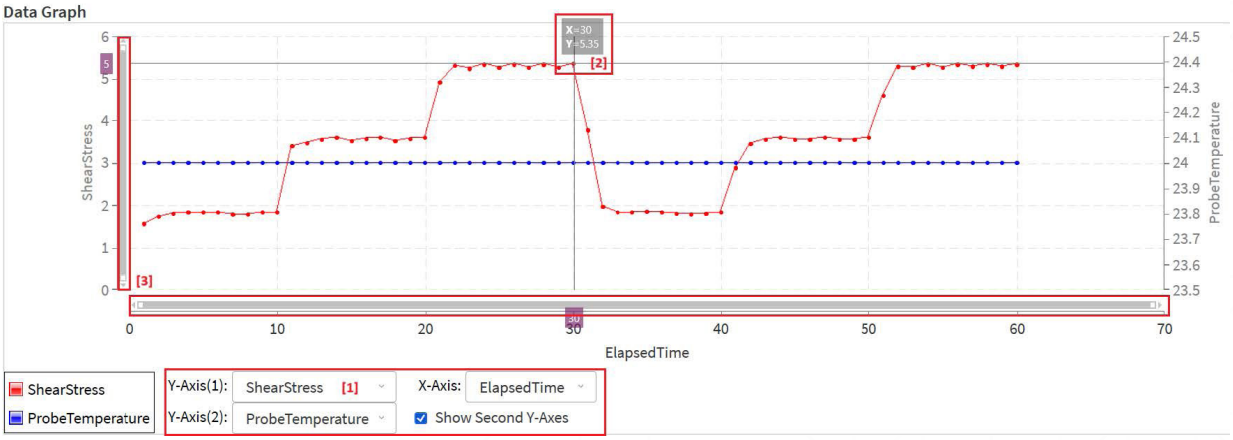
These topics describe what is shown when the user views one dataset:

- Review Data and Analysis
- Choose Report Layout and Settings

These topics describe what is shown when the user compares several datasets:

- Compare Data and Analysis
- Comparison Report Layout and Settings

7.1 Review Data and Analysis



Data Table

multi with last value

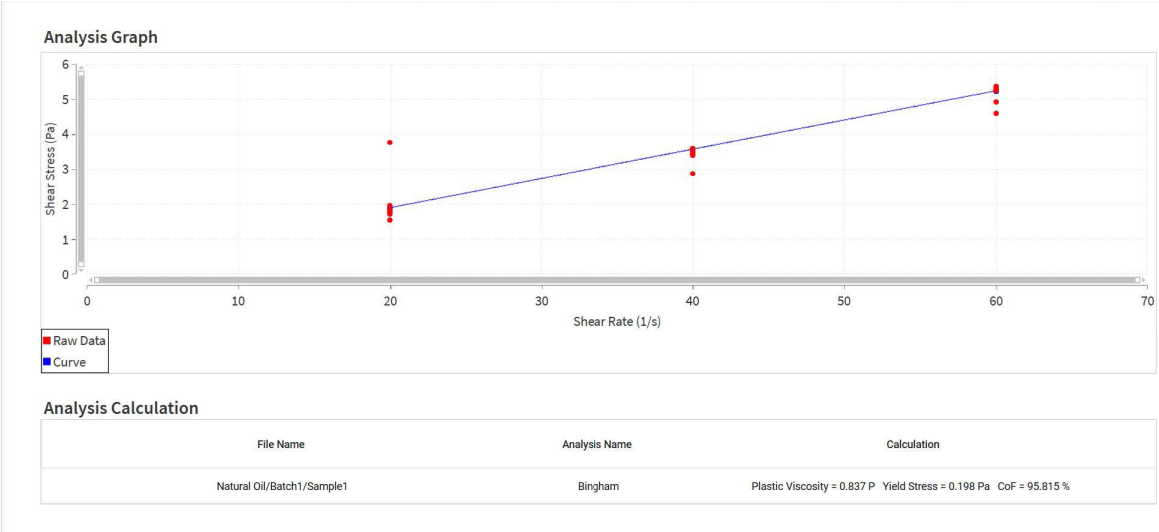
Point #	Time (s)	Viscosity (P)	Speed (RPM)	Torque (%)	Shear Stress (Pa)	Shear Rate (1/s)	Probe Temp. (°C)
1	2	14.75	20	5.9	8.26	5.6	16.1
2	3	23	20	9.2	12.88	5.6	16.1
3	4	24.25	20	9.7	13.58	5.6	16.1
4	5	26.75	20	10.7	14.98	5.6	16.1
5	6	26.75	20	10.7	14.98	5.6	16.1
6	7	27	20	10.8	15.12	5.6	16.1
7	8	28.75	20	11.5	16.1	5.6	16.1

7.2 Data tab:

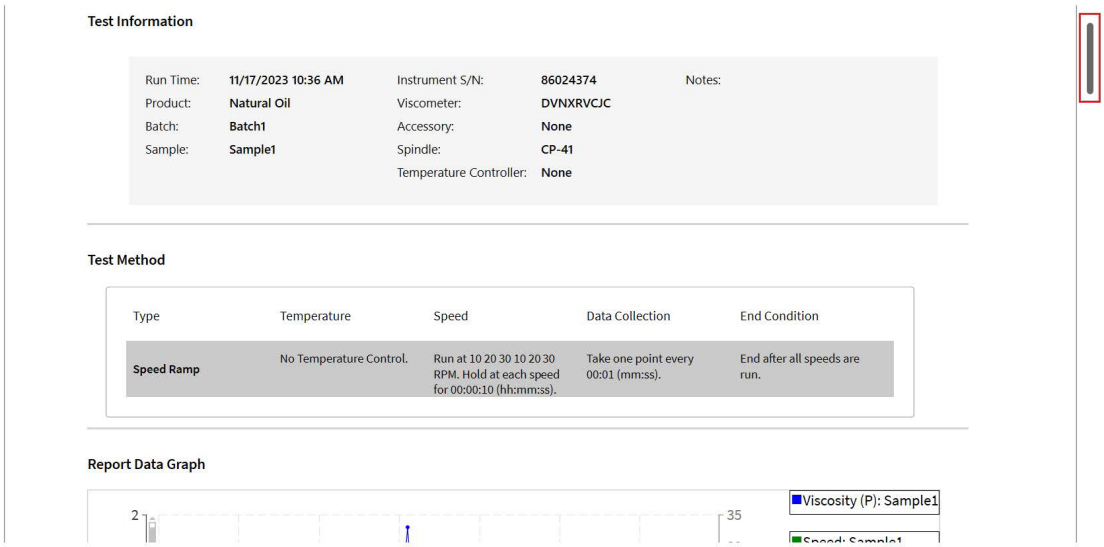
- This tab displays the Data Graph and the Data Table.
- On the Data Graph, the user can change what field is displayed [1] on each axis.
- They can rescale each axis using the resizing bars [3], or zoom by clicking and dragging to draw a box over the area they are interested in.
- They can also place the cursor on a point and the crosshairs [2] will display the X and Y values for that point.
- The Data Table lists all data points collected.
- Only fields relevant to that dataset are shown in the Data Table. For example, if a temperature probe was connected to the instrument during data collection, the Data Table will display a Probe Temperature column with those values. If no probe was connected, no column will be shown.

7.3 Analysis tab:

- This tab shows any relevant analysis, based on the test type and the settings chosen.
- This analysis may include a graph and/or calculated parameters and/or a table of results.
- In some cases, such as for the Temperature Ramp test type and calibration check, there is no analysis to show on this tab.



7.4 Review the Report



The Report includes all pertinent information about the test run and the data collected:

- The Test Information section lists the time that the test was run, the sample identification, and the devices used for the test.
- The Test Method section lists the details of the test that was run.
- The Data Graph section plots all collected data points.
- The Data Table section lists all collected data points.
- The Analysis section displays results of analysis performed on the collected data. The analysis shown is dependent on the test type and the settings chosen.

Use the scrollbar on the right side of the report to view all the different sections.

This preview shows the report as it will appear in a printout or PDF export. Note that for CSV and XLSX exports, the same data will shown in approximately the same layout, but graphs will not be included. To customize the report, click the Edit button in the top right corner above the preview (see Choose Report Layout and Settings).

7.5 Compare Data and Analysis

When comparing multiple datasets, the Data and Analysis tabs will be similar to when viewing one dataset (see Review Data and Analysis), with a few additions:

- All datasets will be shown in the Data Graph, one line per dataset. The Y2 axis option is not available when comparing multiple datasets. By default, the Data Graph will use graph format settings from the most recent dataset.
- The Data Table section will display each sample name as a tab, and that tab will contain the dataset's Data Table.
- The Analysis tab will show the analysis of all the datasets. If the analysis includes a graph, that Analysis Graph will contain one analysis line for each dataset. Note that the software cannot show the comparison Analysis Graph if datasets with different math models are loaded, due to the difference in data formats.

7.6 Comparison Report Layout and Settings

When comparing multiple datasets, the Report Layout options are the same as when viewing one dataset (see Choose Report Layout and Settings), with the addition of the 'Show Data Details' option.
In Comparison Reports, certain sections (Test Information, Test Method, and Data Table) repeat, one for each dataset being compared. The user may not want see these 'Data Detail' sections for all the datasets being compared. For a Comparison Report, in the Report Edit screen there will be a 'Show Data Details' option above the edit tabs. The options are:

- 'Latest Dataset', to include the Data Details from the most recent dataset.
- 'Choose/Select All', to see the Data Details of all the compared datasets.
- 'Choose' and select specific datasets that the user wants to see the Data Details for.

Related topics:

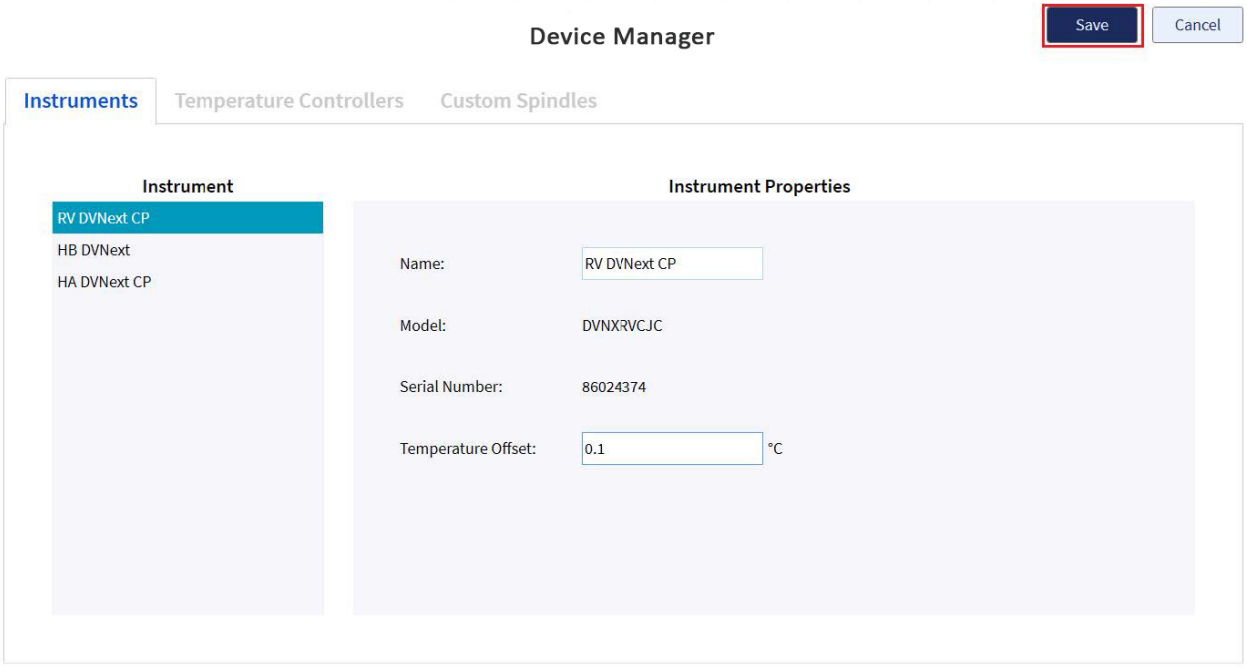
- Choose Report Layout and Settings

8. SETTINGS AND UTILITIES

Settings and utilities can be accessed from the menu at the top of the software screen. The following utilities are available under Configuration:

- Action and Help
- Settings
- Devices
- Database Backup and Restore
- Administrator Tools
- License Manager

8.1 Device Manager: Instruments



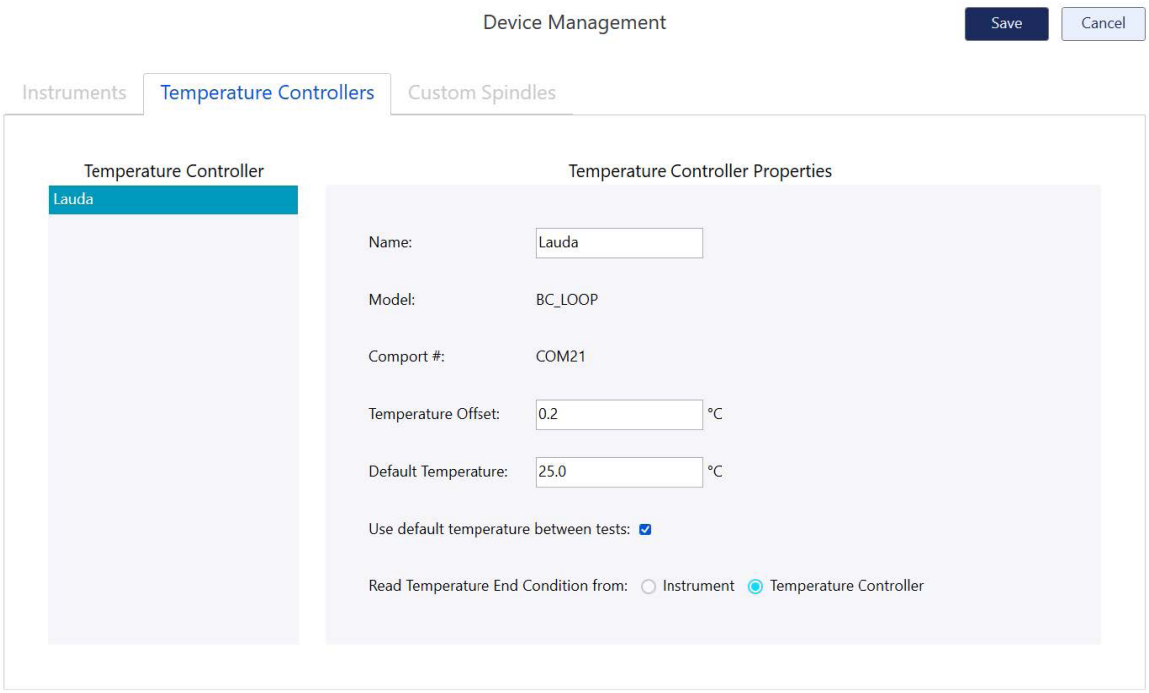
The "Instruments" page of the Device Manager shows information about all instruments which have been connected to the software. The instruments are listed down the left side. When an instrument from the list is highlighted, details about that instrument appear on the right. Listed are the name, model, serial number, and temperature offset.

The “Name” is the friendly name displayed within the software, and can be changed by the user.

The “Temperature Offset” on this page applies to the temperature probe connected to the instrument. It can be adjusted to correct the probe readings to match the user’s reference thermometer.

Note that changes made on this page do not take affect until the "Save" button is clicked.

8.2 Device Manager: Temperature Controllers



The "Temperature Controllers" page of the Device Manager shows information about all temperature controllers which have been connected to the software. The temperature controllers are listed down the left side. When a temperature controller from the list is highlighted, details about that temperature controller appear on the right. Listed are the name, model, comport it is connected to, temperature offset, default temperature, and options.

The “Name” is the friendly name displayed within the software, and can be changed by the user.

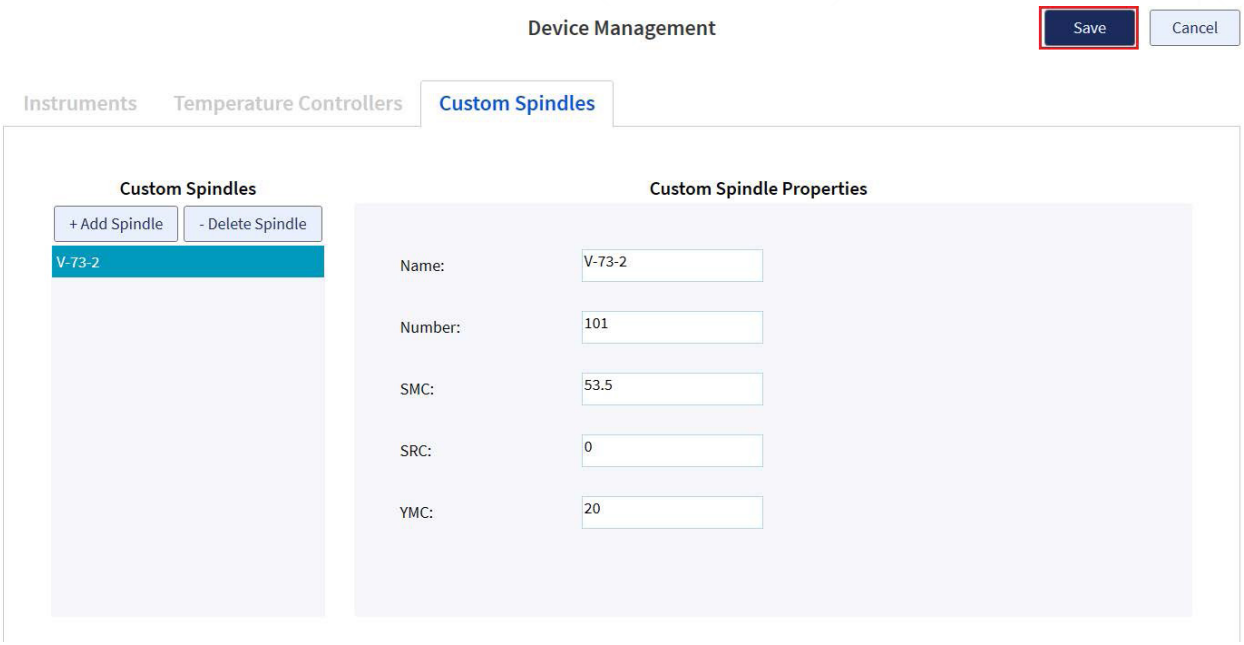
The “Temperature Offset” on this page applies to the temperature probe used by the temperature controller. It can be adjusted to correct the probe readings to match the user’s reference thermometer.

The default temperature determines what temperature the controller will be set to when the software first connects with it. If “Use default temperature between tests” is checked, this will also be the temperature that the controller is returned to after the test run is complete.

The “Read Temperature End Condition from” setting is used when there is both a probe connected to the instrument and a temperature controller connected. If a test step should wait until a specified temperature is reached, the readings from the chosen device will determine when that test step is done.

Note that changes made on this page do not take affect until the "Save" button is clicked.

8.3 Device Manager: Custom Spindles



The "Custom Spindles" page of the Device Manager is used to record the spindle factors of custom made spindles. Any custom spindles created are listed down the left side. When a custom spindle from the list is highlighted, details about that custom spindle appear on the right. Listed are the name, number, and spindle factors.

Once a custom spindle has been added, it will appear in the spindle drop down list in the "Create Test" section (see Enter Device Setup and Sample Details). If the custom spindle is chosen for a test, all of the viscosity, shear rate, and shear stress calculations for that data file will be calculated using that custom spindle’s factors.

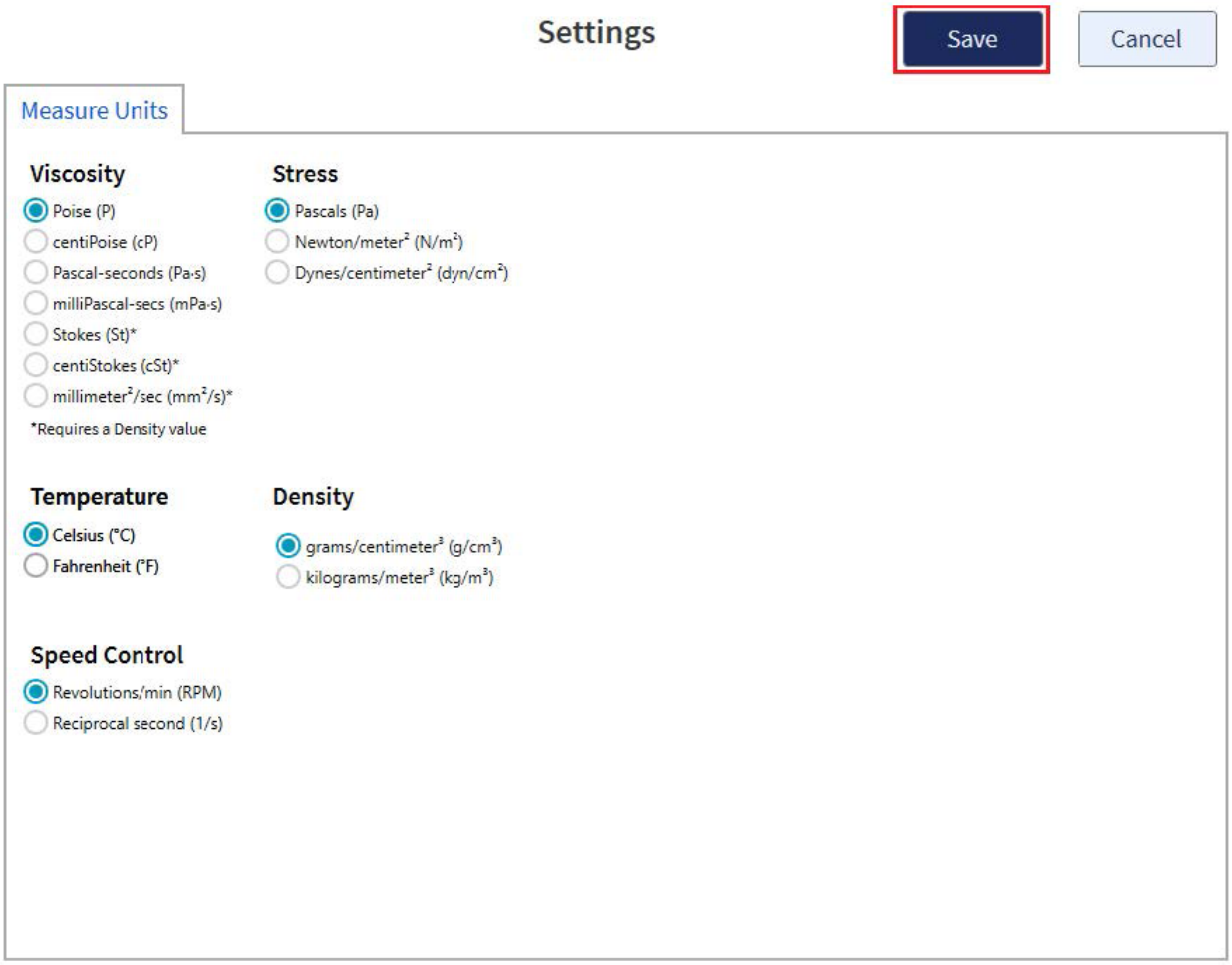
Click the ‘Add Spindle’ button to add a new spindle to the list. It is created with default values.

The name, number, and spindle factors of the highlighted spindle can be edited to reflect that spindle’s properties.

Click the ‘Delete Spindle’ button to remove a spindle from the list.

Note that changes made on this page do not take affect until the "Save" button is clicked.

8.4 Settings



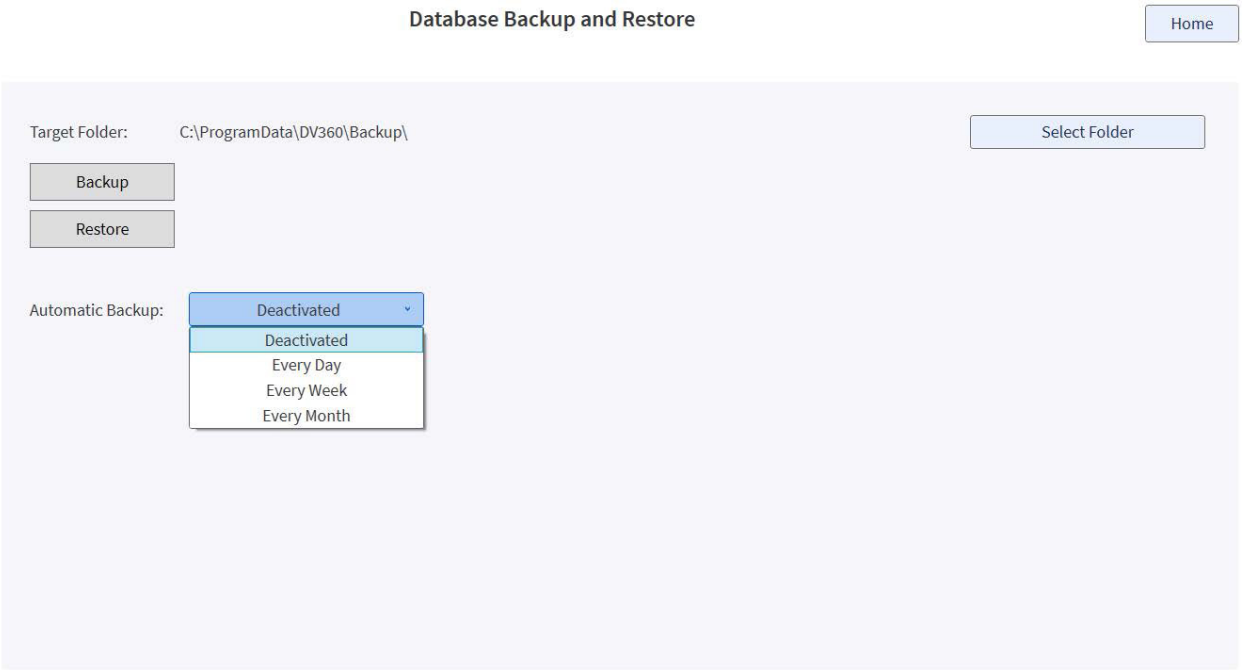
The "Measurement Units" page under "Settings" can be used to change what units the software parameters and data are displayed in.

Note that ‘Stokes’, ‘centiStokes’, and ‘millimeter²/sec’ are Kinematic Viscosity units. If these units are used, the Density must be set during test creation (under Test Generation > Advanced Parameters > Temperature section) so that the Kinematic Viscosity can be calculated.

The Speed Control setting determines if speed control test parameters are in RPM or 1/s. This affects how the test parameter values are interpreted, but it does not affect the data collected: both the Speed in RPM and the Shear Rate in 1/s are always displayed in the Dashboard and in the Data Table.

Once you have made all desired changes to the Measurement Units, click "Save", then ‘Yes’ to restart the software. Note that the Measurement Units will not change until the software has restarted.

8.5 Database Backup and Restore



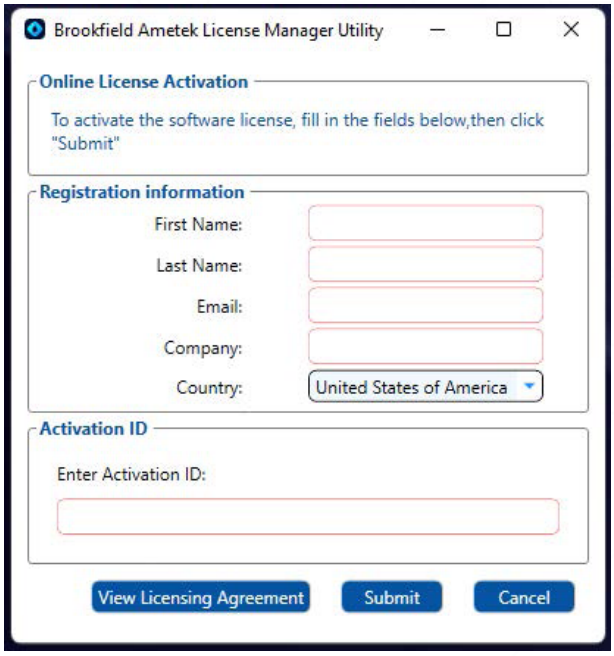
The "Database Backup and Restore" page can be used to backup the software's database, either manually or automatically, or to restore the database from a backup file.

The user can manually backup the database by clicking the 'Select Folder' button to select the "Target Folder" where the backup will be saved to, then clicking the "Backup" button. The backup will be saved to a file named 'DV360_DB_Backup.bak'.

The administrator can also set the Automatic Backup, to occur every day, week, or month to the Target Folder. The automatic backup time and day is based on the time when the automatic backup task was created; users can go into Windows Task Scheduler and change the time and day afterwards if desired (note: this will require admin rights to the computer). Note that the software must be run as Administrator (right-click on the software icon and choose 'Run as Administrator') in order to set up automatic backup.

The administrator can also restore the database by clicking the Restore button, and choosing the backup file from the Open dialogue.

8.6 License Manager



Trial Period:

- When the software first starts, it will ask the user if they want to activate now, or just open the software.
- If the user chooses to open the software without activating, the 30 day trial period will start.
- The software is fully functional during the trial period.
- The user can activate the software at any time (see below).
- When the trial period is close to ending, the software will start prompting the user to activate each time it starts, and display the number of days left for the trial.
- Once the trial period is complete, the software will not run without being activated.

Activate the License:

- The user can activate the software by clicking 'Activate Now' the first time the software is started, **OR**
- They can activate at any time by choosing "Configuration" > "License manager" from the main menu.
- To activate, fill in the Registration Information and the Activation ID, and click "Submit".
- You should receive the Activation ID via email after purchasing the software license.
- Note that the Activation ID email may arrive up to 2 business days after the purchase.

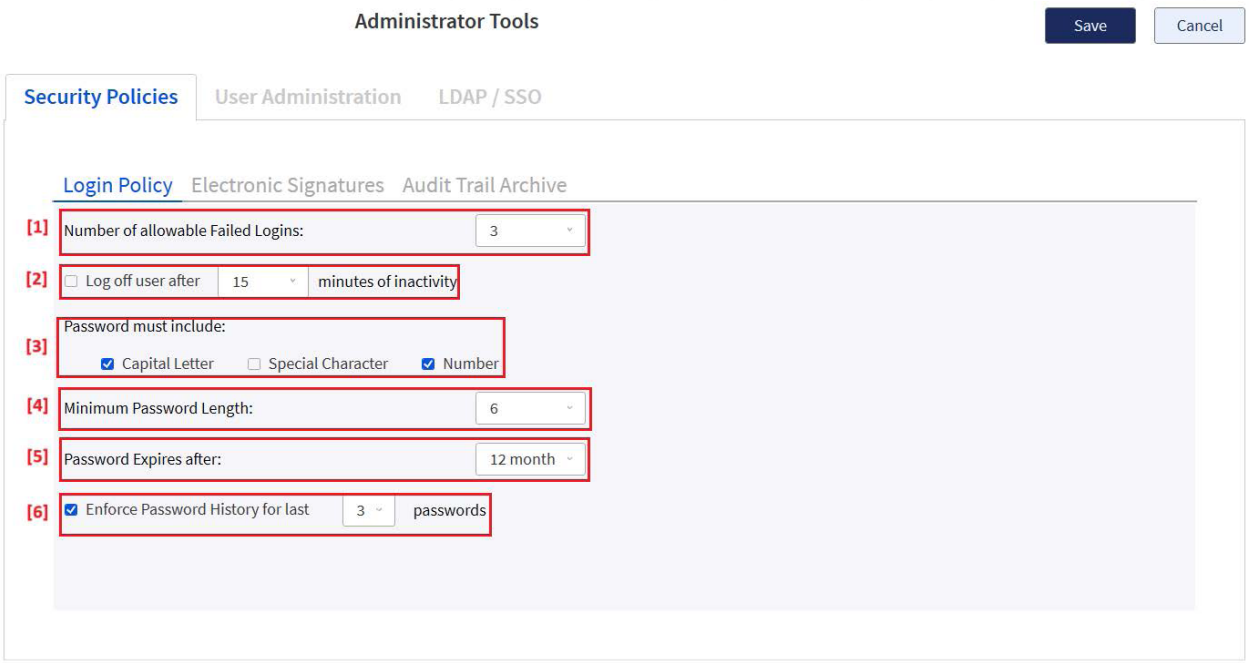
9. ADMINISTRATOR (INCL. 21 CFR PT. 11) TOOLS

The following topics describe the different administrative settings:

- Security Policies
- User Administration
- LDAP/SSO

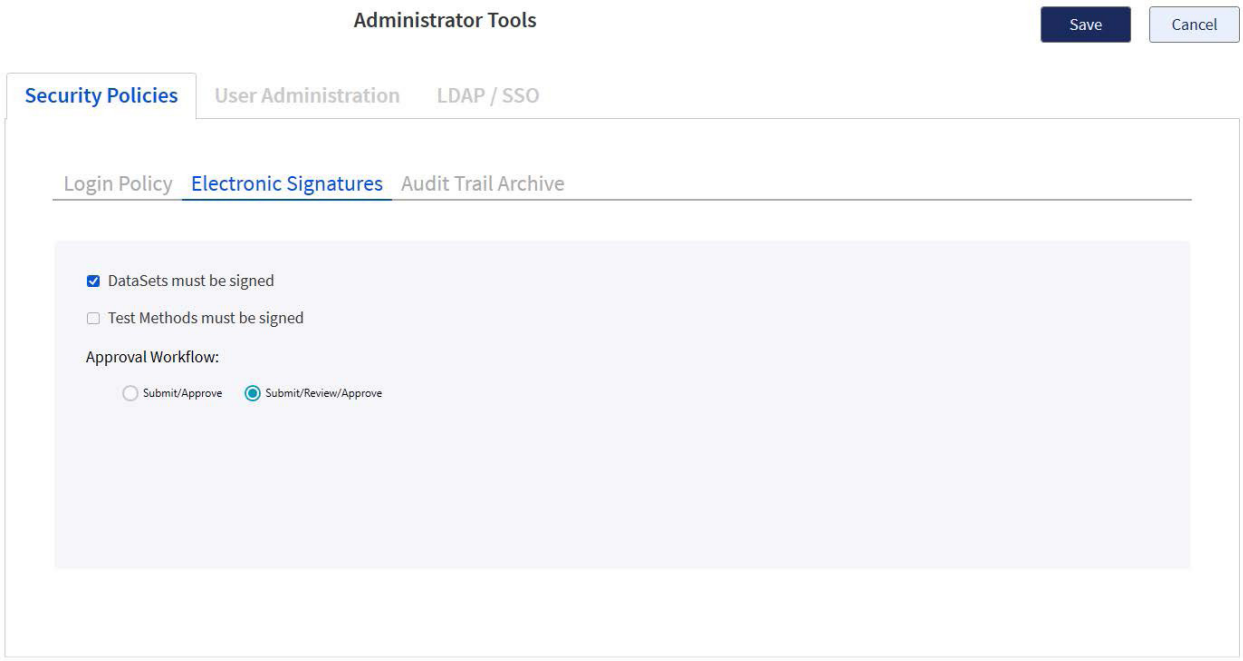
9.1 Security Policies

The following describes the various security and data integrity policies that can be set within the Security Policies page:



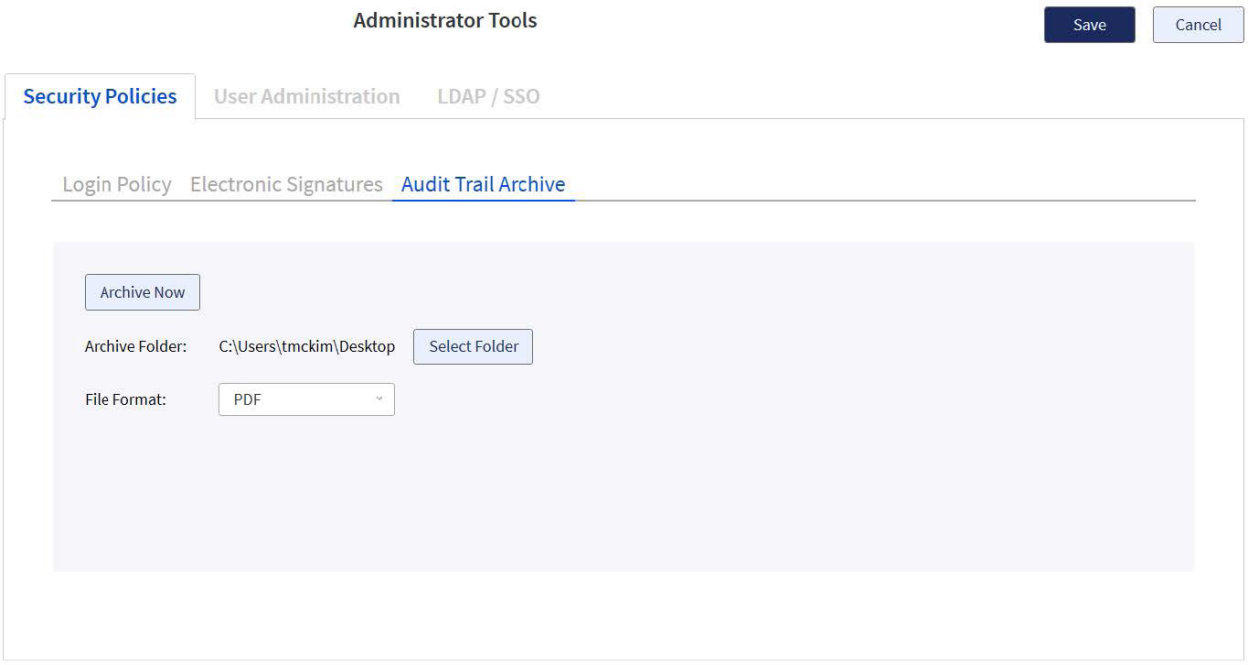
Login Policies:
In the Login Policies tab, the administrator can set the following options:

- Allowable number of failed logins [1]: If the user enters an incorrect password more times than is allowed, their account is disabled, and can only be re-enabled by the administrator.
- Forced log off due to inactivity [2]: If the software is left unattended for the specified amount of time, the software will log out. The user will need to log back in before they can interact with the software again.
- Password special character requirements [3]: The administrator can specify that passwords must include the selected types of characters.
- Minimum password length [4]: The administrator can specify that passwords must meet a minimum length.
- Password expiration [5]: If password expiration is set, when the specified time has elapsed, all users will need to reset their password when they next log in.
- Password history [6]: The user will not be allowed to repeat the last x passwords.
- Note that changes made on this page do not take affect until the "Save" button is clicked.



Electronic Signatures:

- The Electronic Signatures tab is used to set up signature requirements:
- In Electronic Signature Tab, the Administrator can either Enable or Disable the Electronic Signing Functionality, with respect to the Test Method and Data Files.
- Enabling the “Data Sets must be Signed” reflects to "Sign the Data Sets" as mandatory.
    - Note: Users are unable to Export/ Print the Data Files until all the Signature workflow completes.
- Enabling the “Test Methods must be signed” reflects as the Test Methods must be signed.
    - Note: Users are unable to Run the Test until Test Method is Signed as per the workflow.
- Approval Workflow: 2 options are available under the Approval Workflow:
    - Enabling “Submit/ Approve” allows the User to Submit and Approve the Test Method/ Data Set based on the permissions.
    - Enabling “Submit/ Review/ Approve” allows the User to Submit, Review and Approve the Test Method/ Data Set based on the permissions.

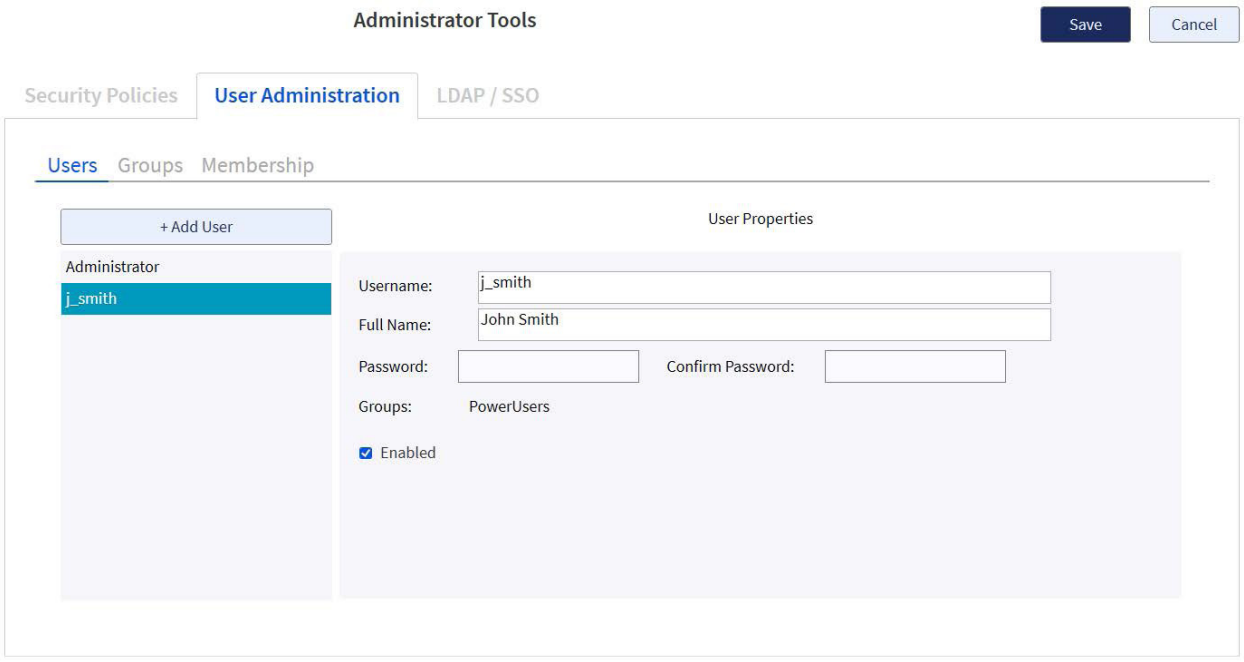


Audit Trail Archive:
The Audit Trail Archive tab can be used to archive older audit trail entries:

- Select the folder where the archive file should be saved.
- Pick the format of the archive file: PDF or CSV.
- Click 'Archive Now' to archive the entries.
- Note that changes made on this page do not take affect until the "Save" button is clicked.

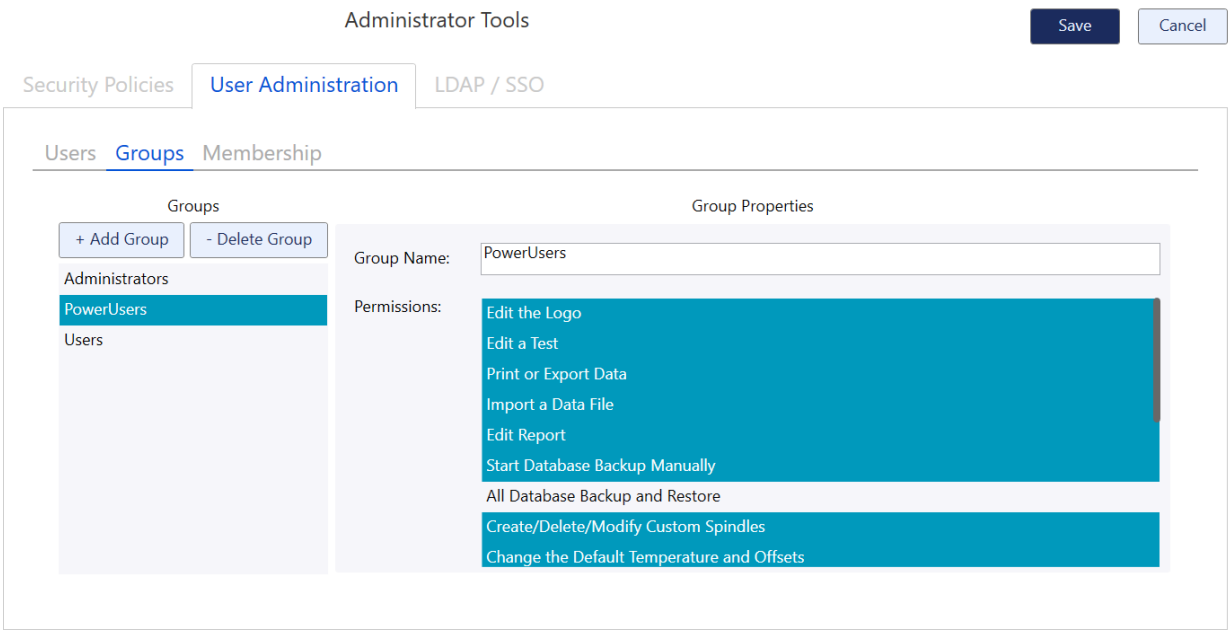
9.2 User Administration

The "User Administration" page is used to set permissions for users. These permissions determine the user's access to various software functions. There are three steps to assigning these permissions: creating users, defining groups, and assigning users to groups (Membership).



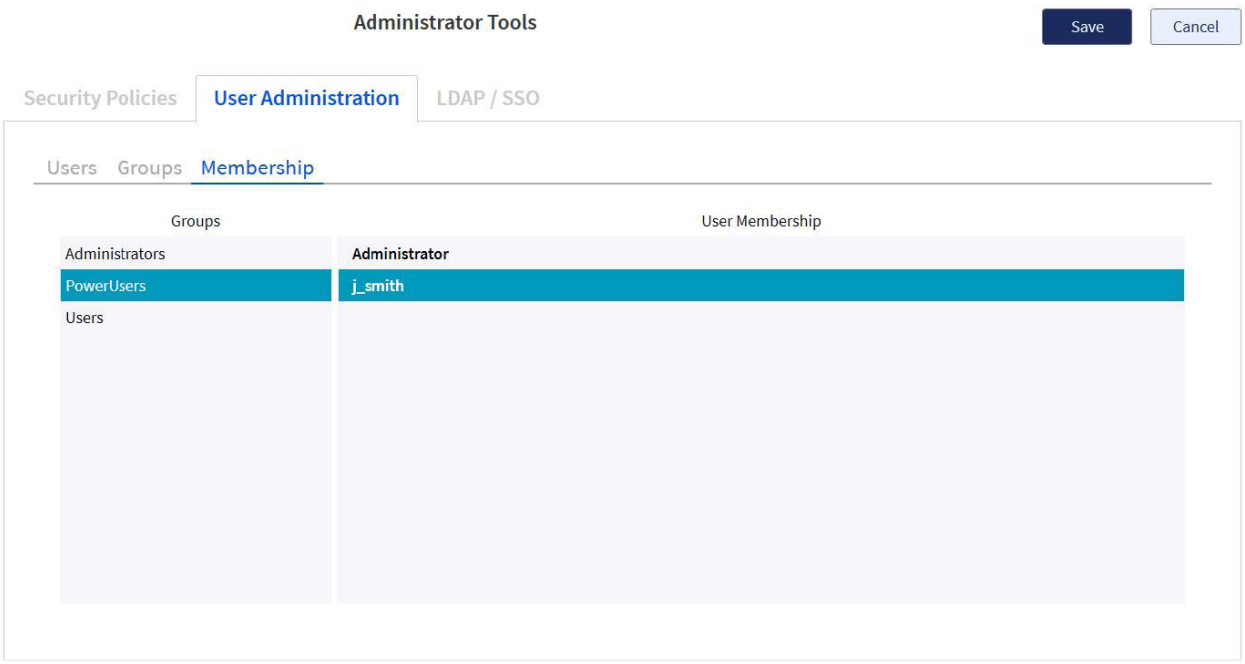
Users Tab:
To Create/Edit a User:

- The "Users" tab shows a list of the existing users down the left, and details about the highlighted user on the right.
- On the "Users" tab, click the “Add User” button to create a new user or multiple users, or highlight an existing user to edit it.
- Enter the user’s username and Full Name. The Full Name will appear in any electronic signatures.
- Enter and confirm the password. Note that the password entered by the administrator will be a temporary password, and the user will be required to change their password when they next log in.
- Also note that a new user must be assigned to a group before that user can be saved.
- Note that changes made on this page do not take affect until the "Save" button is clicked.



Groups Tab:
To Create/Edit a Group:

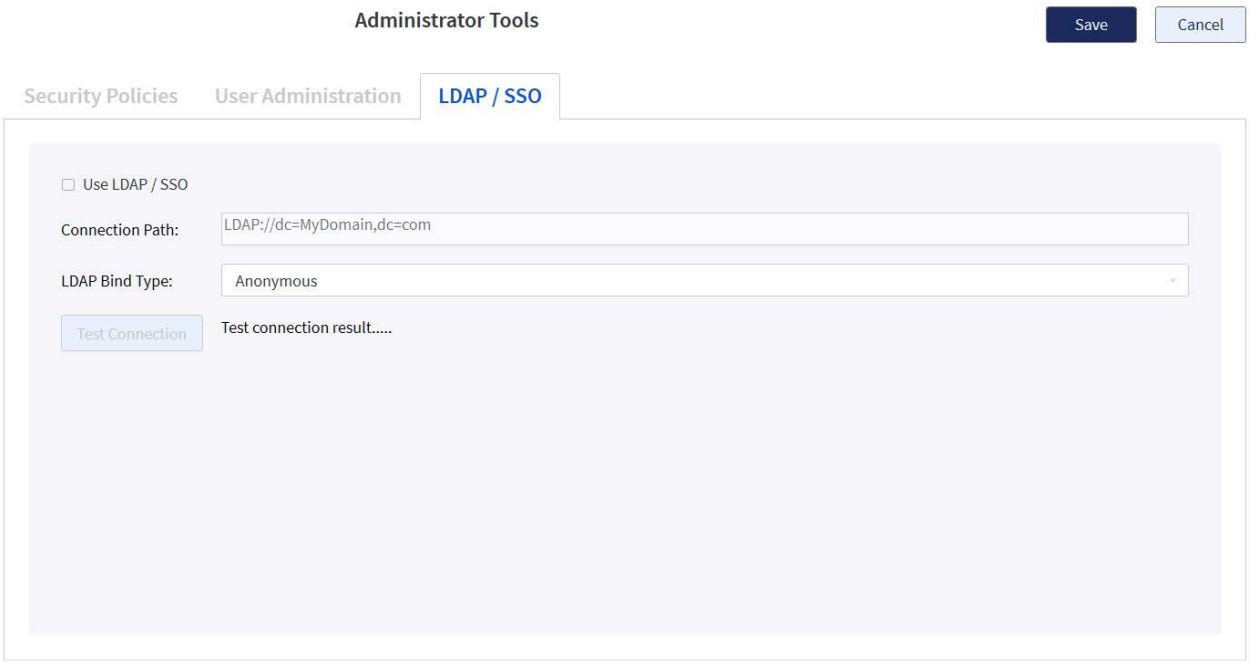
- The "Groups" tab shows a list of the existing groups down the left, and list of permissions allowed to that group down the right.
- The administrator can add a new group by clicking the ‘Add Group’ button.
- The administrator can delete an existing group by highlighting that group and clicking the ‘Delete Group’ button.
- When you highlight a group on the left, the highlighted permissions on the right show that group’s allowed permissions.
- Allow or deny a permission to a group by highlighting that group on the left, then clicking "permission" on the right.
- Note that changes made on this page do not take affect until the "Save" button is clicked.



Membership Tab:
To Assign Membership:

- The "Membership" tab list the existing groups down the left, and the existing users down the right.
- When you highlight a group on the left, the highlighted users on the right show that group's members.
- Add or remove a user from a group's membership by highlighting that group on the left, then clicking the username on the right.
- Note that changes made on this page do not take affect until the "Save" button is clicked.

9.3 LDAP/SSO

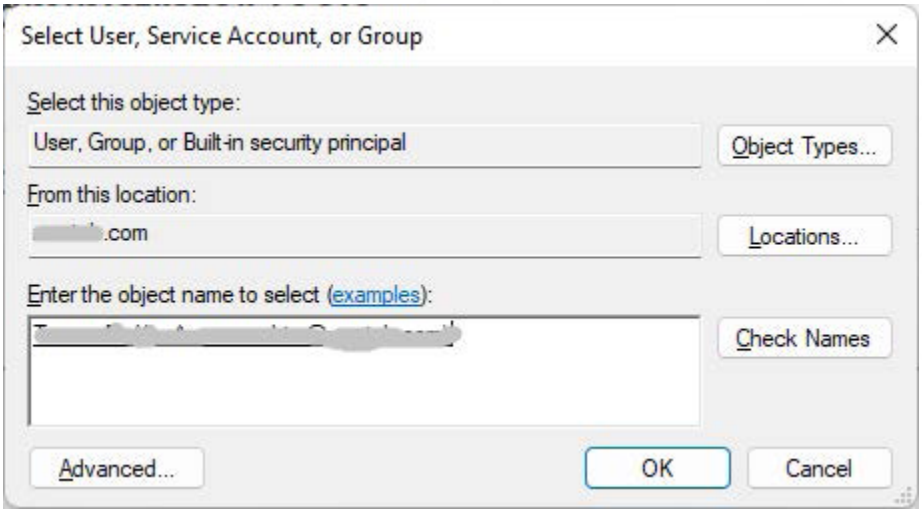


If your organization uses Lightweight Directory Access Protocol (LDAP), the software can be set up to use user domain credentials. In this case, the software would automatically sign in with the same username that is currently logged into the computer (Single Sign On, SSO). Your IT department will know if your orgainzation uses LDAP.

To Set Up LDAP/SSO:

- Check the ‘Use LDAP/SSO’ option.
- Adjust the Connection Path so that it is correct for your directory environment. Your IT department will have more information about the correct path.
- Once the path is set, click the ‘Test Connection’ button to test the connection.
- Note that changes made on this page do not take affect until the "Save" button is clicked.

Once you have a successful LDAP connection, you can configure your users. Note that for successful SSO, each user who should have access to the software must be set up in the software with membership to an access level group (see User Administration). With the LDAP option set up, when the administrator clicks the ‘Add User’ button on the Users tab, the following dialog will come up:



Enter the username the same as it is entered when logging into the computer. You can click ‘Check Names’ to make sure the username is entered correctly. Click OK to add the username to the Users tab.

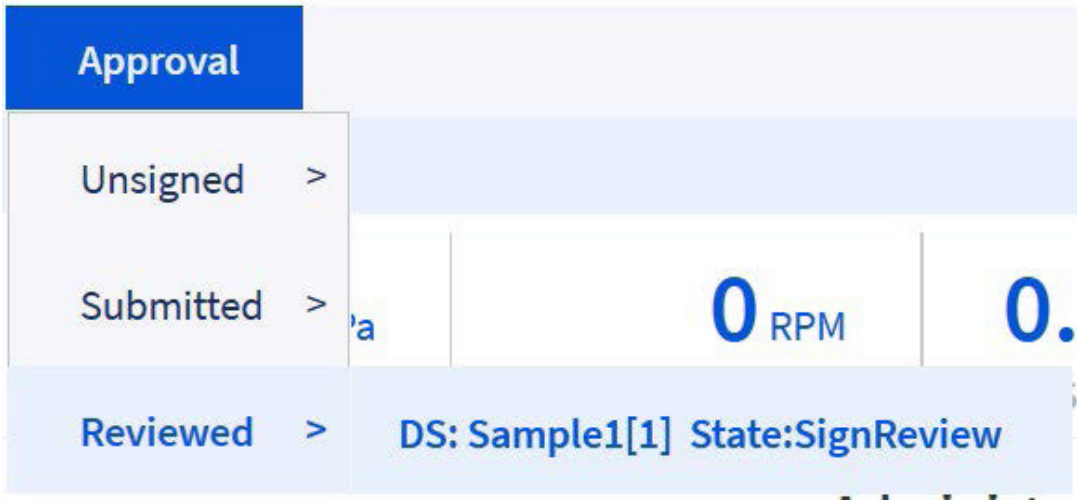
9.4 Secure User Activities

If User Administration has been set up, users will need to log in to the software at startup.

Note that what you see within the software will be dictated by what permission were granted to you by your administrator. If there is a feature described in this help which is not visible in the software, it may be that your administrator did not grant you access to that feature.

9.5 Signing Data and Tests

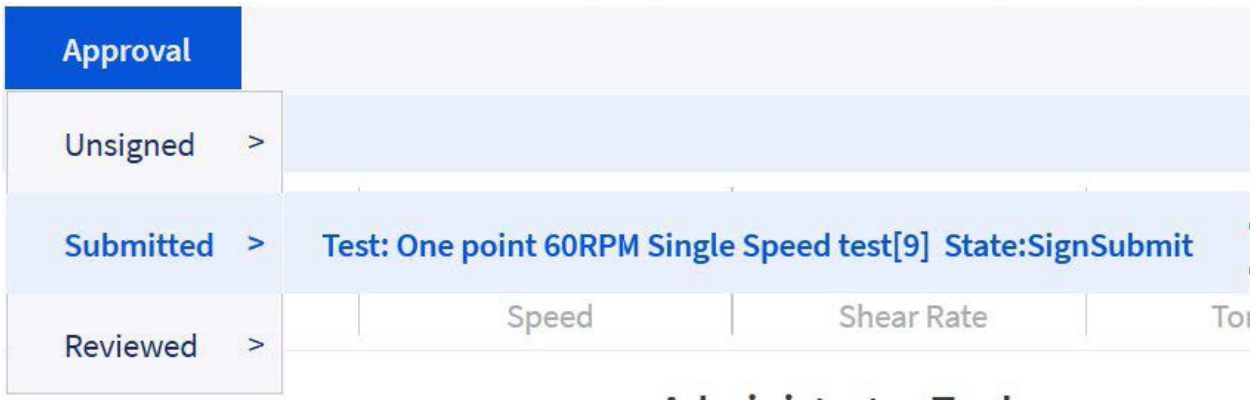
The following describes the workflow and methods for signing Data files or Test Methods:



Signing Data Files:
After the test run is complete, on "Report" page the user clicks the "Submit" button to sign the dataset as Submitted.

In the "Approval Menu", users can see which datasets (and test methods) need further review. For example, in the above picture, the “Sample1” dataset has been signed as Submitted and Reviewed, and now needs to be signed as Approved. If electronic signature is enabled, when the user clicks a dataset item in the "Approval menu", the dataset opens on the "Report" page of the "View Data" section. The reviewer can see the details of the dataset in the report, and they can also click on any of the other tabs in the "View Data" section. When the review is complete, the reviewer clicks the "Approve" button on the Report page to sign as Approved.

The user can also see the approval level of all datasets by filtering/sorting on approval level column in the Home page/View Data search grid (see Home Page).

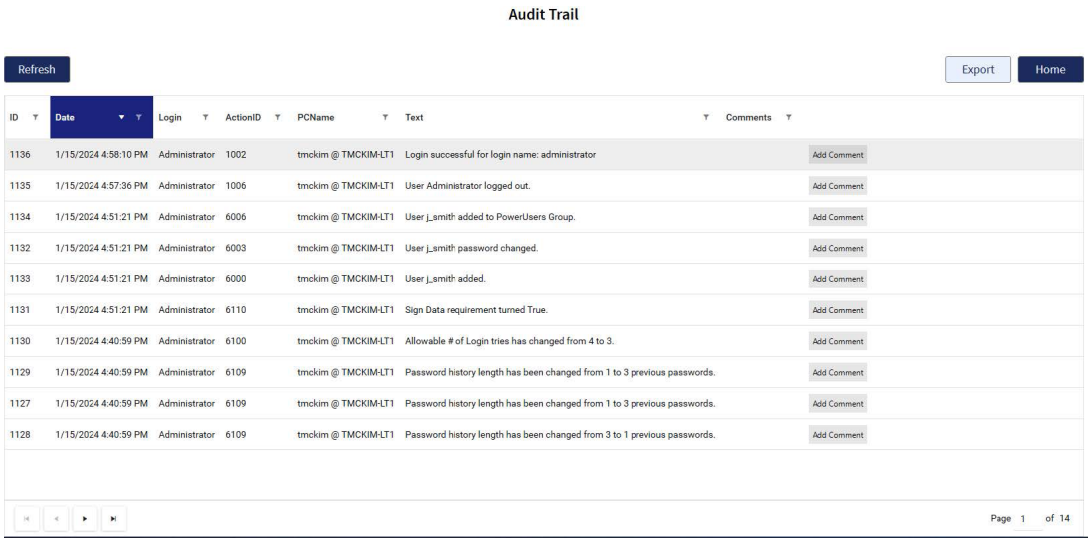


Signing Test Methods:
On the "Save Test" page (Save the Test), once the test method is created and saved, the user clicks the "Sign" button to sign the test method as Submitted.

In the "Approval Menu", users can see which test methods (and datasets) need further review. For example, in the above picture, the “One point 60RPM Single Speed test” has been signed as Submitted and now needs to be signed as Reviewed. When the user clicks on a test method item in the "Approval Menu", the test method will open on the "Save Test" page of the "Create Test" section. The reviewer can see a summary of the test on this page, and they can also click on any of the other tabs in the "Create Test" section (Create a Test) to see more details of the test method. When the review is complete, the reviewer clicks the "Sign" button on the "Save Test" page to sign as Reviewed.

The user can also see the approval level of all test methods by filtering/sorting on approval level column in either the Home page/Create Test search grid or the Home page/Run Test search grid (see Home Page).

9.6 Audit Trail



The Audit Trail tracks any event affecting security or data integrity.

The Audit Trail table consists of the following columns:

- The ID column, which provides a unique sequential number for each audit trail entry.
- The Date column, which shows the date and time that the event occurred.
- The Login column, which shows the username of the user logged in to the software at the time of the event.
- The Action Id column, which classifies what type of event occurred.
- The PC Name column, which shows the name of the computer where the event originated from and the computer login at the time of the event.
- The "Text" column, which describes the event.
- The "Comments" column, which shows any comment which has been added to the audit entry.

The user can filter or sort the entries by clicking on the header for each column. The top of the page will decribe how the entry list is currently being filtered.

The user can add a comment (after providing login credentials) to an audit trail entry by clicking the ‘Add Comment’ button for that entry line, and filling out the dialog which comes up.

The user can click the "Export" button to export the audit entries to a PDF file. Note that the PDF export will show the entry list as it currently appears on the "Audit Trail" tab. The top of the PDF report will describe how the entry list has been filtered, if applicable.

APPENDIX A – TROUBLESHOOTING

If you encounter a software issue that you cannot resolve, please contact AMETEK Brookfield for assistance. Please have the following information on hand:

- An exact description of the error that occurred. Screenshots are useful.
- The circumstances under which the error occurred: which button was pushed, what operation was underway, etc.
- Any changes to setup or usage from when the software was operating properly to when the error occurred.
- The software, rheometer, firmware, and temperature controller models.
- The computer operating system, its processor speed, and amount of RAM.
- The most recent Technical Support Log (located in the "C:\ProgramData\AMETEK Brookfield\DV360\Log" folder)

Problem	**Solution**
Won't Connect to Instrument	Check USB Cable/Connection Ensure Instrument is in External Mode
Won't Connect to Temperature Bath	Check USB Cable/Connection Ensure Bath is turned on
Feature(s) not available to User	Ensure User has the correct permissions enabled
Run Button greyed out	Ensure Instrument is connected.
User forgets password	Contact your Administrator to reset your password.
Administrator forgets password	Make sure "Administrator" is entered as the login, click "Forgot Password", and follow the verification process described to reset your password.

APPENDIX B - WARRANTY REPAIR AND SERVICE

AMETEK Brookfield Viscometers and Accessories are guaranteed for one year from the date of purchase against defects in materials and workmanship. They are certified against primary viscosity standards traceable to the National Institute of Standards and Technology (NIST). The Viscometer must be returned to AMETEK Brookfield or to the authorized dealer from whom it was purchased for a warranty evaluation.

Transportation is at the purchaser's expense. The Viscometer should be shipped in its carrying case together with all spindles originally provided with the instrument. If returning to AMETEK Brookfield, please contact us for a return authorization number prior to shipping.

Many AMETEK Brookfield units are supplied from the factory with a Calibration Seal. The warranty stated above will be voided if the Calibration Seal has been damaged. Only AMETEK Brookfield or our authorized servicing dealers may break the Calibration Seal for purposes of instrument repair or recalibration.

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