

This document is an addendum to  
the ANKOM<sup>TDF</sup> Dietary Fiber Analyzer Operator's Manual.

This document does NOT replace the Operator's Manual.



Rev 6/14/23

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## Introduction

The ANKOM<sup>TDF</sup> Dietary Fiber Analyzer was designed to automate multiple gravimetric methods. This document describes how to configure and use the ANKOM<sup>TDF</sup> Dietary Fiber Analyzer for the methods defined by AOAC 2017.16 Rapid Integrated Total Dietary Fiber (RINTDF), AOAC 2022.01 (RIN IDF/SDF) & AACC 32-60.01.

**NOTE:** Please review this entire document and the ANKOM<sup>TDF</sup> Dietary Fiber Analyzer Operator's Manual before you begin using the instrument for these procedures.

## Accessories

The following accessories are needed to run the identified Dietary Fiber methods on your ANKOM<sup>TDF</sup> Dietary Fiber Analyzer and come with your instrument or with your upgrade kit.

<p>1 – Amylase/AMG Container (TDF57)</p> 	<p>1 – Acetic Acid Container (TDF59) &amp; Fluid Tube Label</p> 	<p>1 – Sodium Maleate Buffer Container (TDF60) &amp; Fluid Tube Label</p> 	<p>6 – Glass Filtrate Cups (TDF97)</p> 	<p>1 – TDF17 Control Panel</p> 
<p>1 – Trizma Base Container (TDF58)</p> 				

## Instrument Configuration

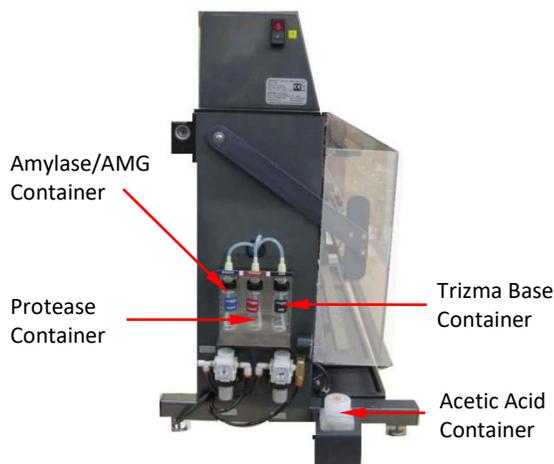
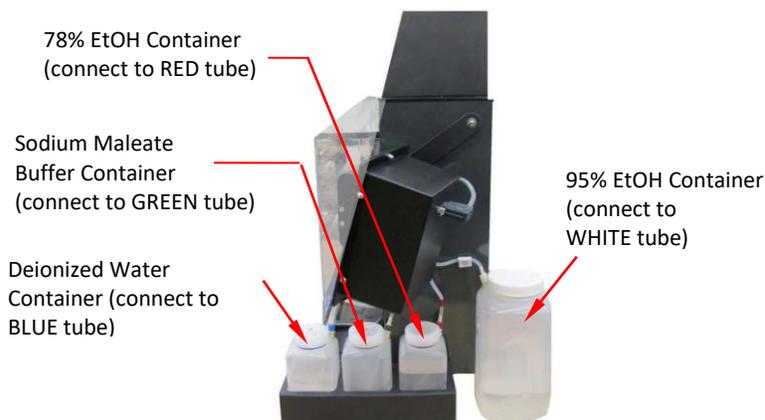
To run the identified Dietary Fiber methods, your ANKOM<sup>TDF</sup> Dietary Fiber Analyzer must be configured with the proper:

- Chemical and Enzyme Containers and Glass Filtrate Cups
- Fluid Tube Labels
- Control Panel, programmed with methods 2017.16 & 2022.01
- Mixer Duty Cycle
- Volume Calibration
- Temperature Calibration

To configure your instrument to run the identified Dietary Fiber methods, follow the steps below.

### 1. Install chemical and enzyme containers and place glass filtrate cups at each station.

If you have used the instrument for the AOAC 991.43/985.29/2001.03 methods, the AOAC 2017.16/2022.01 configuration will require you to replace some of the chemical and enzyme bottles. Configure the chemical and enzyme bottles according to the pictures below (continued on the next page).

**Acetic Acid, Trizma Base, and Enzyme Containers (Left Side View)**

**Buffer, Water, and Ethanol Containers (Right Side View)**


Place glass filtrate cups at each of the six stations for collection of low molecular weight dietary fiber filtrate for HPLC analysis.

**2. Install tube labels for this method.**

Color-coded labels are attached to each fluid tube to help ensure that the correct chemicals are connected to the correct tubes. For the AOAC 2017.16/2022.01, the additional labels should be installed as follows.

- 2.1 Apply the **BLACK** Acetic Acid Tube label to the HCl tube on the left side of the instrument.
- 2.2 Apply the **GREEN** Sodium Maleate Buffer label to the Buffer tube on the right of the instrument.

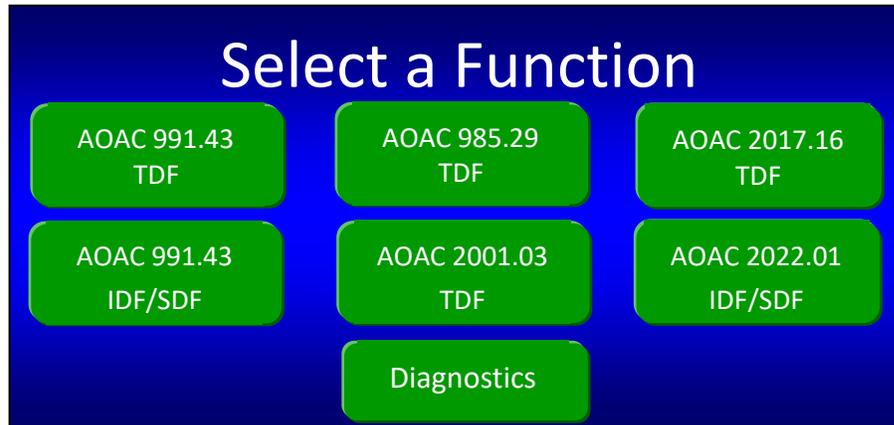
**NOTE:**

If you purchased your instrument with the AOAC 2017.16/AOAC 2022.01 methods already enabled, you will see on the Touch Screen Display the buttons for those procedures on the "Select a Function" screen. In that case, you do NOT need to do steps 3 and 4 below because they were already done at the factory.

**3. Install new TDF17 Control Panel and confirm AOAC 2017.16/2022.01 is enabled.**

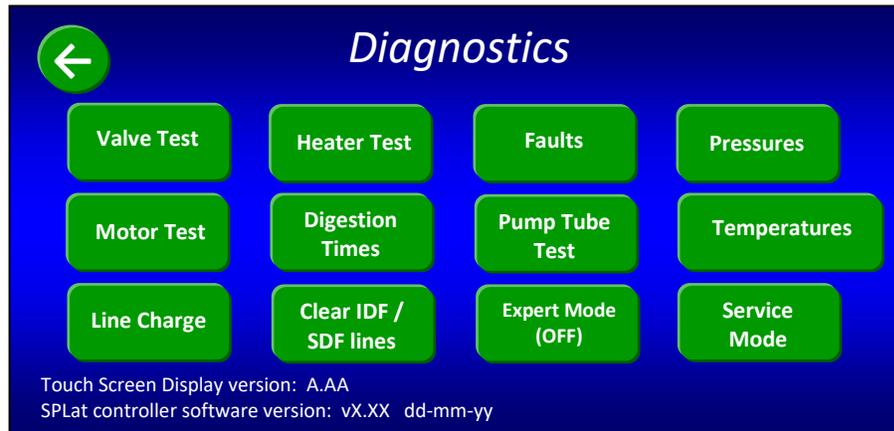
If you purchased your instrument without the AOAC 2017.16/2022.01 configuration already enabled, and you are now implementing the upgrade kit, you will receive a new TDF17 Control Panel. Install this, first removing the old one.

- 3.1 Turn the instrument ON. After the instrument initializes, you will see the "Select a Function" screen on the Touch Screen Display. Confirm all 6 methods appear, including AOAC 2017.16 and 2022.01.

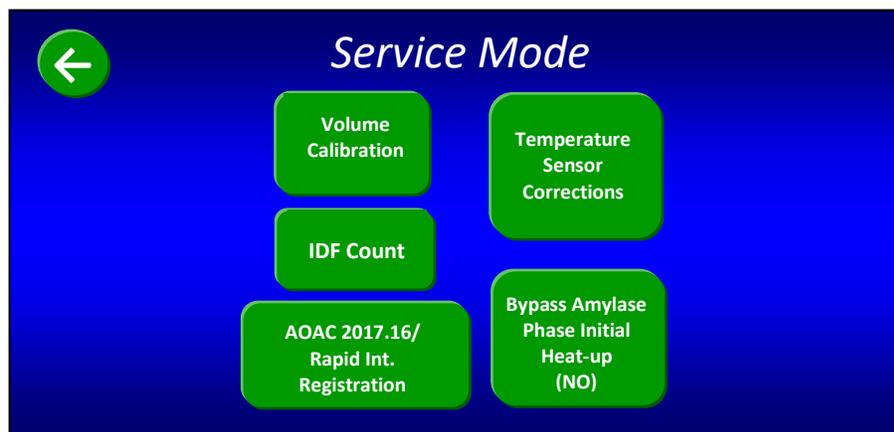


If necessary, enable the methods using the following instructions for AOAC 2017.16 and 2022.01.

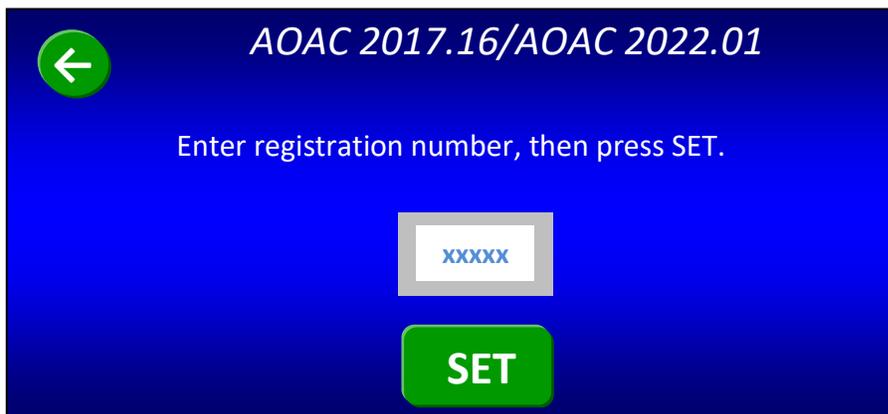
3.2 Press the “Diagnostics” button. The following screen will be displayed.



3.3 Press the “Service Mode” button. The following screen will be displayed.



3.4 Press the “AOAC 2017.16/2022.01” button. The following screen will be displayed.



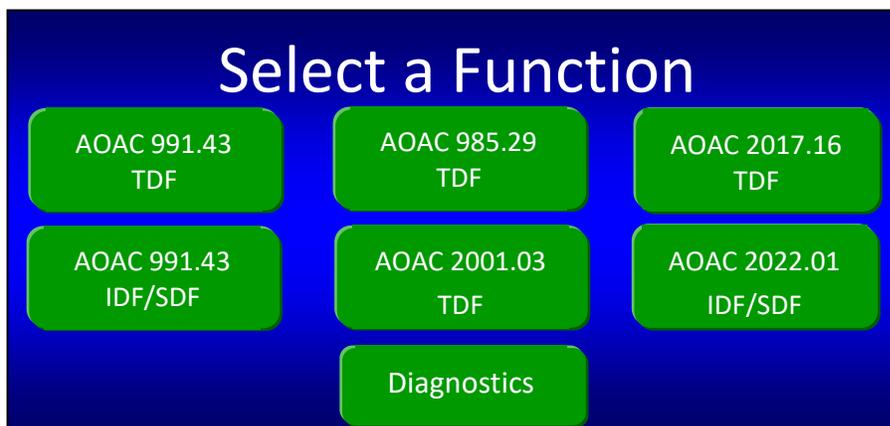
3.5 Press the white button with the gray border. Enter the 5-digit registration code provided by ANKOM and press the **SET** button. The screen will automatically revert to the previous “Service Mode” screen. After properly setting the code, the unique code will unlock the additional programs.

If you enter an incorrect code, nothing will happen, and you will stay on the registration screen. Re-enter the code until the screen reverts to the previous “Service Mode” screen.

Press the top left back arrow two times to return to the “Select a Function” screen. As you can see, there are now two new buttons on the Select a Function screen that allow you to run the “AOAC 2017.16 TDF” & “AOAC 2022.01” methods.

**NOTE:**

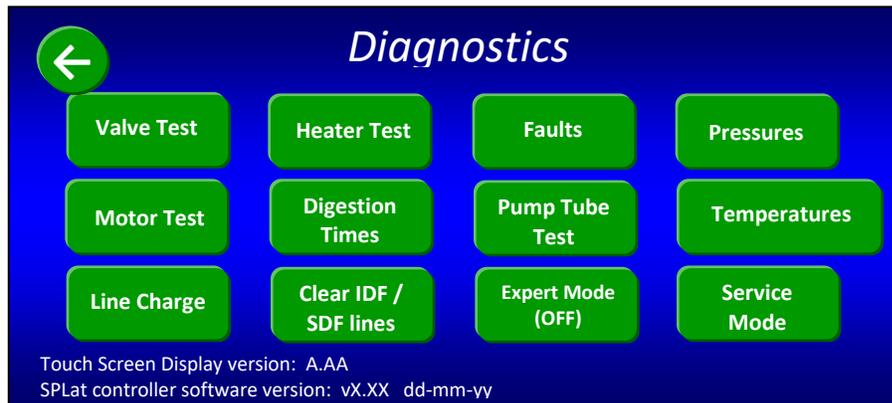
Although the instrument works in accordance with AACC 32-60.01, the Touch Screen Display only refers to the AOAC methods.



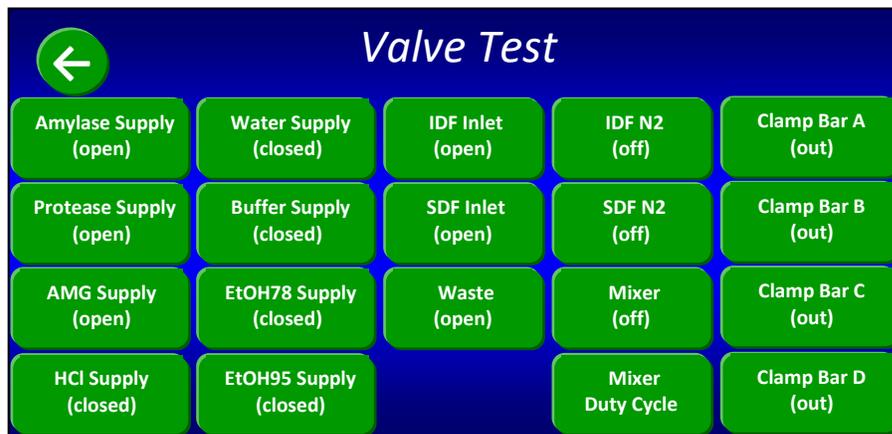
#### 4. Verify that the Mixer Duty Cycle is set appropriately.

The mixer duty cycle for the AOAC 2017.16/2022.01 methods is "5". To verify the setting, follow the steps below.

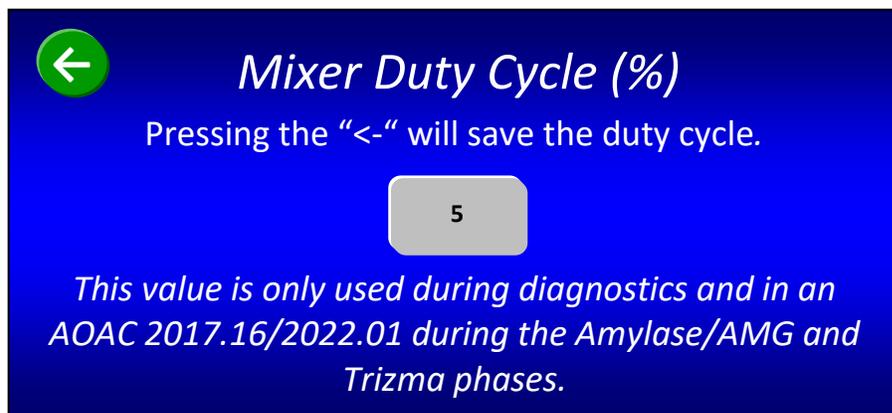
4.1 Press the “Diagnostics” button on the "Select a Function" screen. The following screen will be displayed.



4.2 Press the “Valve Test” button. The following screen will be displayed.



4.3 Press the “Mixer Duty Cycle” button. The following screen will be displayed.



4.4 If the number on the gray button is NOT "5", press the gray button and enter "5".

4.5 Press the back  button to save the duty cycle number. This will configure the mixer to run 5% of the time during the mixing process to comply with AOAC 2017.16/2022.01.

4.6 Press the back  button two more times to return to the "Select a Function" screen.

## 5. Volume Calibration

5.1 With the installation of a new TDF17 Control Panel, it will be necessary to perform volume calibration in order to save the correct calibration time in memory.

5.2 Refer to the ANKOM<sup>TDF</sup> Operator's Manual section entitled "Volume Calibration Procedure" to calibrate fluid delivery volume.

## 6. Temperature Sensor Calibration

6.1 With the installation of a new TDF17 Control Panel, it will be necessary to perform calibration in order to save the temperature sensor corrections in memory.

6.2 Refer to the ANKOM<sup>TDF</sup> Operator's Manual section entitled "Temperature Sensing" to calibrate the temperature sensors.

Your instrument is now configured to run the AOAC 2017.16/2022.01.

## Dietary Fiber Analysis Support Items

The following support items needed to perform the fiber analysis may be purchased separately:

Item	ANKOM Part #
Heat Sealer for sealing the filter bags	HS (120V), HSi (220V)
IDF Filter Bags	DF-I
SDF Filter Bags (used for SDF and TDF procedures)	DF-S
IDF <i>Flow-Thru</i> Bags (TDF procedure only)	DF-FT
Solvent Resistant Marker	F06
Rinse Stand	TDF51
Diatomaceous Earth (DE)	DE1, DE2
Electronic Balance with four-place readout	
Electronic Balance Software	
Drying Oven	
Ashing Oven	
Protein Determination Equipment (Kjeldahl is recommended)	
Equipment to determine the Water: Alcohol Soluble dietary fiber (WASDF)	

## Blanks

**ANKOM recommends you determine BLANK values for IDF, SDF, and TDF calculations with an average of at least 18 BLANK values.** We recommend BLANK values to be redetermine when you change chemical lots. You do not need to run BLANKS with every set of samples once established.

Once you determine your BLANK values, you can add the values to the MS-Excel spreadsheets.



## AOAC 2022.01 IDF/SDF Analysis

An IDF/SDF analysis measures the amount of IDF and SDF within a given sample. This requires the use of ANKOM DF-I and DF-S filter bags. When starting a new run, the ANKOM<sup>TDF</sup> Dietary Fiber Analyzer must have bags installed at all stations (a total of twelve bags).

**NOTE:**

To enhance the productivity of your instrument, you can begin the IDF process for a new run while the SDF process of a previous run is finishing. See the “Productivity Enhancement” section of your ANKOM<sup>TDF</sup> Dietary Fiber Analyzer Operator’s Manual for more details.

To perform an IDF/SDF analysis, follow the steps below.

### 1. Prepare chemicals and enzymes.

When using the ANKOM<sup>TDF</sup> Dietary Fiber Analyzer for the Rapid Int. method, use the chemicals and enzymes referred to therein. See Appendix A of this manual for the list of chemicals and enzymes and the instructions for how to prepare them for use in this instrument.

**IMPORTANT:**

To prevent any TRIZMA base from crystalizing in the silicone tubing and causing blockages, it is very important to flush this enzyme line at the end of each day that the instrument is used. Refer to Appendix C.

### 2. For samples that have a fat content of 10% or higher, de-fat your samples as needed according to the official methods or your internal SOPs.

### 3. Label the filter bags using a Solvent Resistant Marker.

IDF Bag  
(shorter bag)



SDF Bag  
(longer bag)

### 4. Prepare for data collection.

You will need a place to store the data collected during this analysis. For your convenience, a USB flash drive was included with the instrument and includes a Calculation Template that can be used for this analysis. Please read the “Instructions” tab in the MS-Excel file for information about the spreadsheets.

### 5. Weigh filter bags.

**IMPORTANT:**

Using a Bag Weigh Holder is critical to eliminate the effects of static electricity during the weighing process.

Roll or fold each bag and place it in a tared Bag Weigh Holder. Place the Bag Weigh Holder in the center of a balance and record the weight.


**NOTE:**

Because different balances have different sensitivities, the Bag Weigh Holder should be placed in the center of the balance for best results.

**6. Weigh Diatomaceous Earth (DE).**

DE is used during fiber analysis to enhance the flocculation and filtration of the SDF fraction. Place ca 1g ± 0.05g of DE in each of the six tared and numbered tins/weigh boats and record the weights.

**7. Weigh Samples.**

Place 0.5± 0.05g of sample in each of the six tared and numbered tins/weigh boats and record the weights.

**NOTE:** A larger sample (1.0g) can be used to improve precision if necessary.

**8. Confirm Nitrogen Supply and Pressure Ranges.**

Make sure the Nitrogen supply in your lab is connected to the instrument and turned on. The High-Pressure Gauge on the left of the instrument should be set between 50-55 psi. The Low-Pressure Gauge on the right side of the instrument should be set at 4 psi. The accuracy of the Low-Pressure Gauge should be checked prior to each run by pressing the “Pressurize SDF” button on the control panel twice.



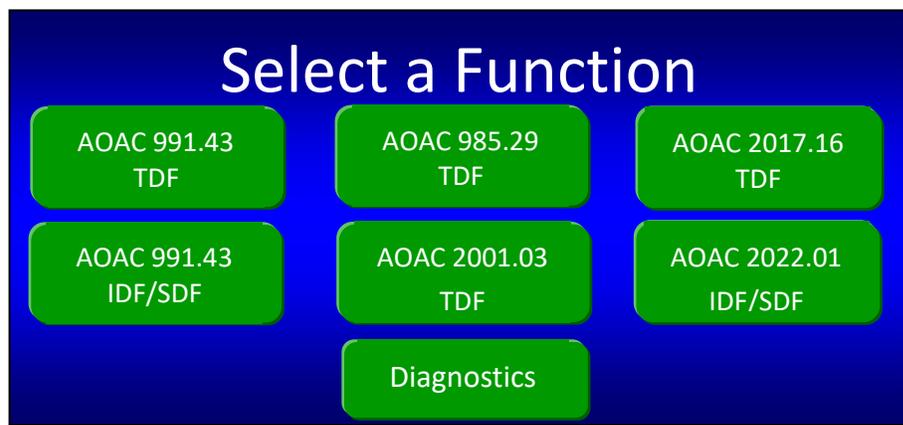
**9. Turn the instrument power on.**

When you turn the power on, the instrument will run through an initialization process and the Control Panel will turn on.

**10. On the Touch Screen Display, select the instrument function you would like to perform.**

The Control Panel on the ANKOM<sup>TDF</sup> Dietary Fiber Analyzer uses Touch Screen technology. To operate the instrument, you will press identified buttons on the Touch Screen Display and buttons below the screen.

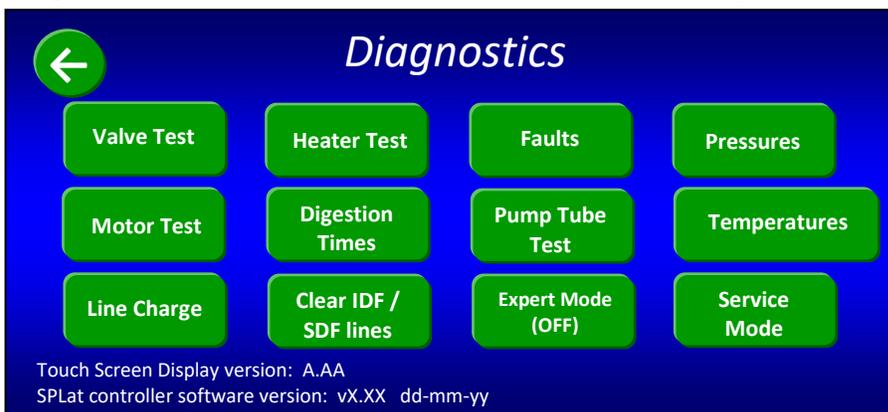
When your instrument is initialized and ready to operate, the following screen will be displayed.



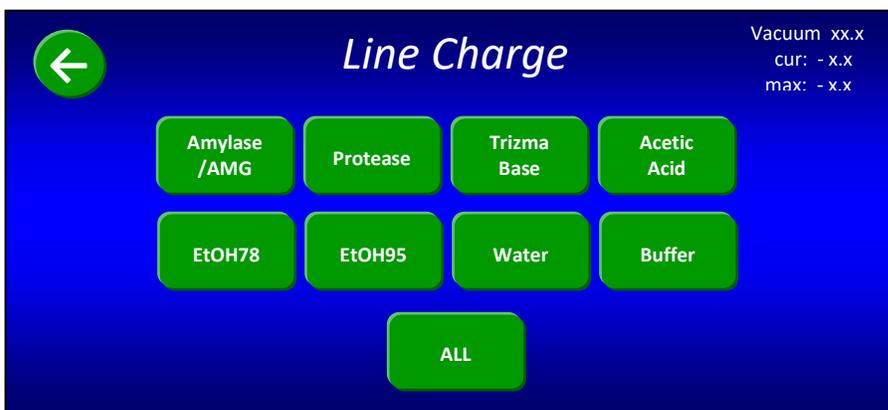
**NOTE:** Although the instrument works in accordance with the AACC 32-60.01 method, the Touch Screen Display only refers to the AOAC methods.

10.1 If this is the first time the instrument is being operated after installation, or if this is the first time the instrument is being operated after sitting unused for a period of time and was flushed according to Appendix C, the lines must be charged to avoid the faults: E13 (Tubing Failure) or E14 (Empty Chemical Container). To charge the lines follow the steps below.

10.1.1 Press the “Diagnostics” button on the “Select a Function” screen. The following screen will be displayed.

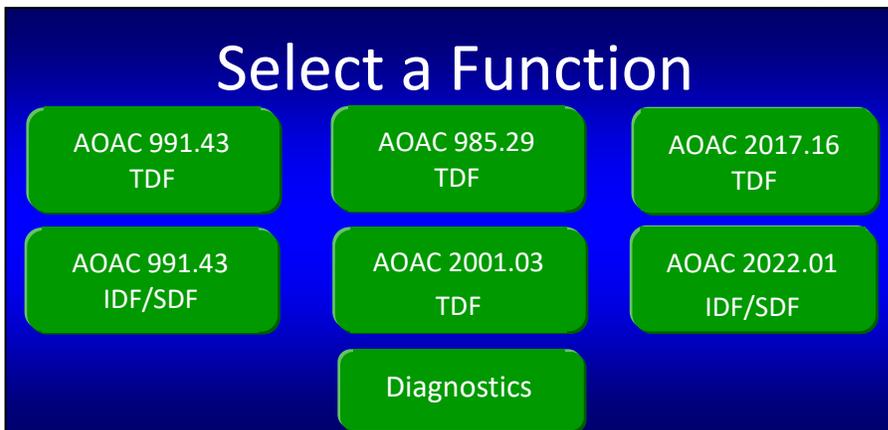


10.1.2 Press the “Line Charge” button. The following screen will be displayed.



10.1.3 Press the “ALL” button to charge all of the lines. Each button will change color as the associated line is being charged. All lines are charged when all of the buttons return to their original green color.

10.1.4 Press the back  button twice. The following “Select a Function” screen will be displayed again.



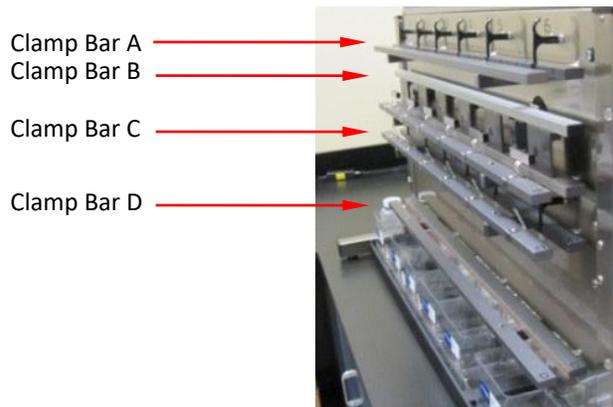
10.2 Press the “AOAC 2022.01 IDF/SDF” button. The following screen will be displayed.



Notice that the function you selected is now displayed in the top right corner of the screen and a back  button is displayed in the top left corner of the screen.

**11. Install SDF filter bags on the ANKOM<sup>TDF</sup> Dietary Fiber Analyzer.**

11.1 Remove Clamp Bars A, B, C, and D by lifting them off of the locator rods.



11.2 Gently pull the black SDF Delivery Nozzle out toward you.



11.3 Place a labeled and weighed SDF bag up underneath the SDF Delivery Nozzle so that the Delivery Nozzle is inside the top part of the bag. Pull the bag up so that the top of the bag is about 35 mm (1.375 inches) above the top of Clamp Bar C and return the Delivery Nozzle to its original position. This will hold the back of the bag in place.



**IMPORTANT:**

As part of normal operation, solution from the IDF bag will flow into the SDF bag. Therefore, when installing the SDF filter bags it is very important to position them high enough vertically so that at least 20 mm (0.75 inches) of the filter part of the IDF bag can fit inside the top of the SDF bag.

11.4 With the bag being held by the Delivery Nozzle, center it horizontally between the lines on the back part of Clamp Bar C.

Centering Lines



- 11.5 Repeat the previous steps for all six stations.
- 11.6 Re-install Clamp Bar D by setting it on the locator rods. Make sure the letter is on the top of the bar and the rubber material is facing in toward the instrument.
- 11.7 Flatten the bags to remove any wrinkles.
- 11.8 With fingers away from the clamp bars, press the check mark (☑) button on the Touch Screen Display to pinch the bags just above the filter. The following screen will be displayed.



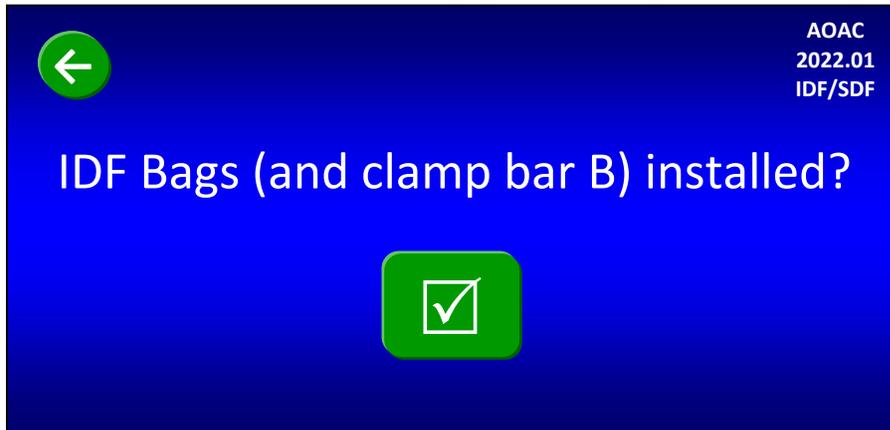
## 12. Add DE to the SDF filter bags on the ANKOM<sup>TDF</sup> Dietary Fiber Analyzer.

- 12.1 Open the top of the SDF bag and add the #1 weigh tin/weigh boat of DE to the bag by folding the tin and then dipping it down into the bag below the tip of the Delivery Nozzle.



**IMPORTANT:** When adding DE to the filter bags it is very important to keep it below the tip of the Delivery Nozzle so that the DE material can be properly rinsed.

- 12.2 If necessary, rinse the weigh tin/weigh boat with 78% EtOH to ensure complete transfer.
- 12.3 Repeat previous steps for all six stations.
- 12.4 Press the check mark (☑) button on the Touch Screen Display. The following screen will be displayed.



**NOTE:** After you confirm that the DE is added, the Clamp Bar D button on the Control Panel is disabled until the SDF process completes.

## 13. Install IDF filter bags on the ANKOM<sup>TDF</sup> Dietary Fiber Analyzer.

- 13.1 Gently pull the black IDF Delivery Nozzle out toward you.



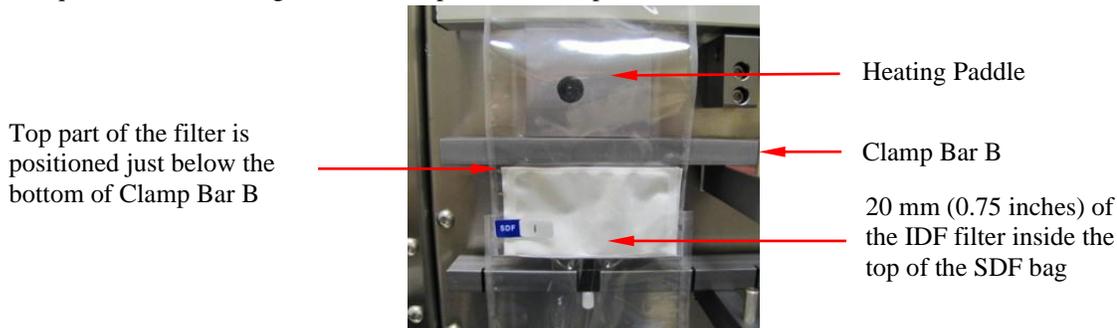
- 13.2 Place a labeled and weighed IDF bag up underneath the Delivery Nozzle so that the Delivery Nozzle is inside the top part of the bag. Pull the bag up so that the top of the filter part of the IDF bag is just below the bottom of Clamp Bar B and return the Delivery Nozzle to its original position. This will hold the back of the bag in place.

13.3 With the bag held by the Delivery Nozzle, center it horizontally between the Centering Lines on the back part of Clamp Bar A.



**IMPORTANT:** For proper mixing during the IDF process the IDF bags must be horizontally centered over the Heating Paddles and between the Centering Lines on the back part of Clamp Bar A.

13.4 Place at least 20 mm (0.75 inches) of the filter section of the IDF bag inside the top of the SDF bag to allow for the flow of liquid into the SDF bag after the IDF process is complete.



- 13.5 Repeat previous steps for all six stations.
- 13.6 Re-install Clamp Bar B by setting it on the locator rods. Make sure the letter is on the top of the bar and the rubber material is facing in toward the instrument.
- 13.7 Flatten the IDF bags to remove any wrinkles.
- 13.8 With fingers away from the clamp bars, press the check mark (☑) button on the Touch Screen Display to pinch the IDF bags just above the filter. The mixing pads will make contact with the bags when Clamp Bar B pinches the IDF bags. The following screen will be displayed.



**14. Add samples to the IDF bags.**

- 14.1 Open the top of the IDF bag and transfer the sample from the #1 weigh tin/weigh boat into the IDF bag by folding the tin and then dipping it down into the bag below the tip of the Delivery Nozzle.

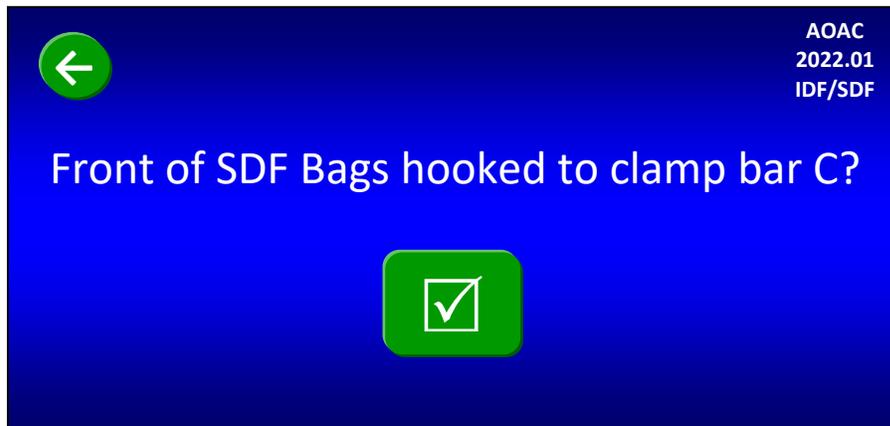


**IMPORTANT:** When adding sample to the filter bags it is very important to keep it below the tip of the Delivery Nozzle so that it can be properly rinsed.

- 14.2 Rinse the weigh tin/weigh boat with as little DI or DW water as possible (maximum 3 ml) to ensure complete transfer.
- 14.3 Repeat previous steps for all IDF stations.
- 14.4 Re-install Clamp Bar A by setting it on the locator rods. Make sure the letter is on the top of the bar and the rubber material is facing in toward the instrument.
- 14.5 Press the check mark (☑) button on the Touch Screen Display. The following screen will be displayed.



14.6 Make sure that all clamp bars are installed with the letter on the top of the bar and the rubber material facing in toward the instrument. Press the check mark (☑) button on the Touch Screen Display. The following screen will be displayed.



**15. Hook the front of each SDF bag in place.**

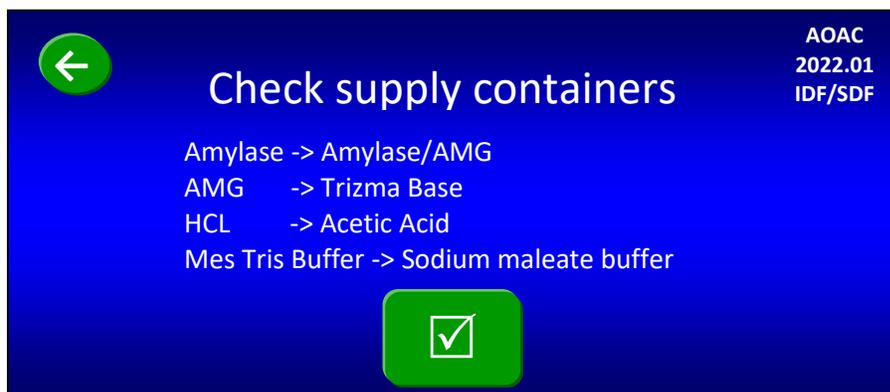
15.1 Secure the SDF filter bags onto the hooks located on the front part of Clamp Bar C by pulling up the middle section of the front of the filter bag evenly and tightly, lean the bag against the hook as the bag is lowered, allowing the bag to catch onto the hook. There should be at least a 1/4" of the top of the bag sitting above the hook.



Hook on front part of Clamp Bar C

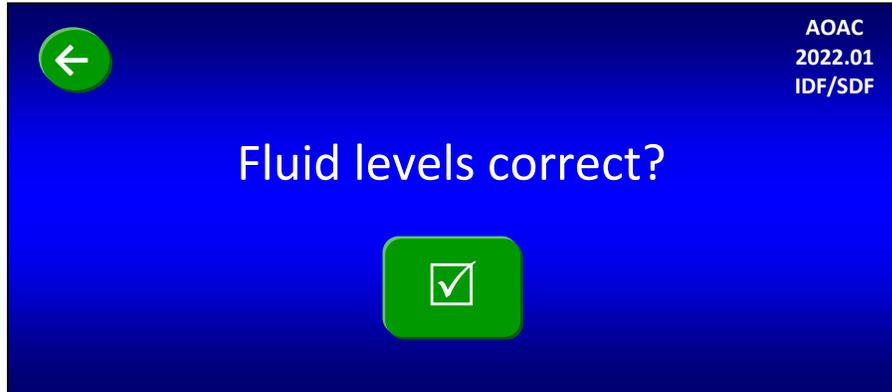
**NOTE:** Hooking the bags in place will put a physical hole in the front of each SDF bag.

15.2 Press the check mark (☑) button on the Touch Screen Display. The following screen will be displayed.



**16. Verify that the fluid containers are correct for this procedure.**

Verify that the fluid supply containers are configured according to the screen above and press the check mark (☑) button. The following screen will be displayed.



**17. Fill fluid containers.**

To ensure that you have enough fluids to run a complete IDF/SDF procedure, you must begin with at least 25 ml of the Amylase/AMG mixture, 15 ml of Protease, 25 ml of Trizma Base, and fluid levels above the Minimum Level lines on the remaining chemical containers. Add fluids and enzymes as necessary.

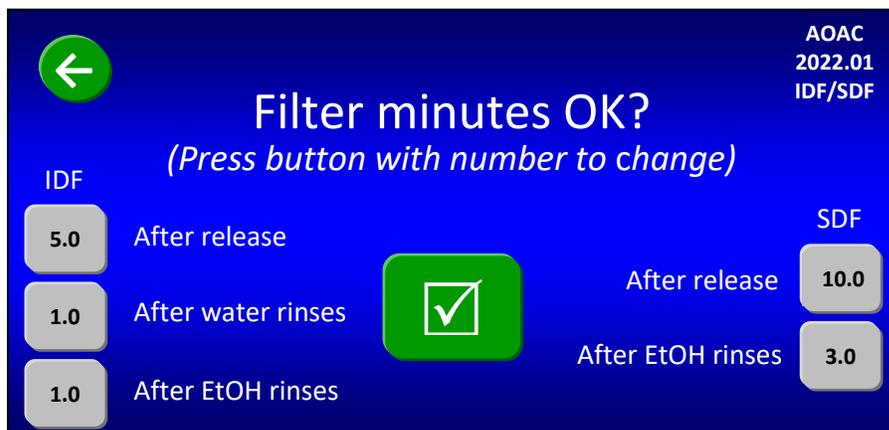
With all fluid containers filled to the proper levels, press the check mark (☑) button on the Touch Screen Display. The following screen will be displayed.



## 18. Confirm Nitrogen Supply Settings.

Confirm the high-pressure gauge on the left of the instrument shows 50-55 psi. The low-pressure gauge on the right side of the instrument should be set at 4 psi.

Press the check mark (☑) button on the Touch Screen Display. The following screen will be displayed.



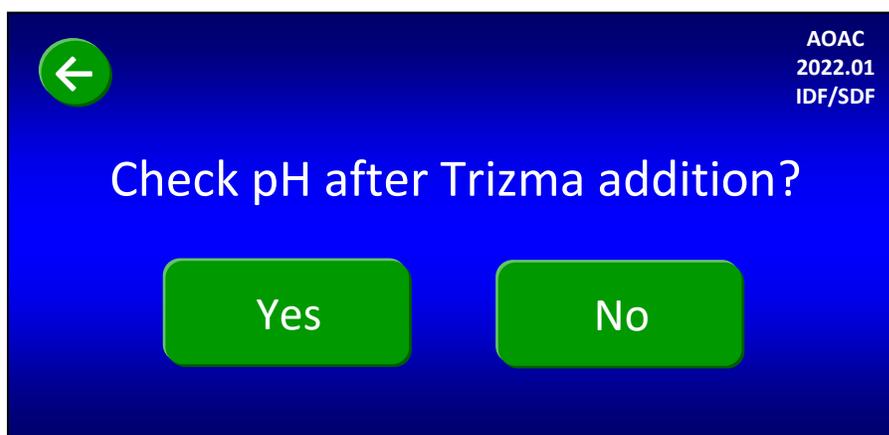
## 19. Set filter times (in minutes).

Because different samples take different amounts of time to filter, the above screen allows you to set your filter times. To change any of the times shown on the screen, press the specific gray button. A number pad will be displayed that will allow you to enter the time that you want. The times you enter will remain until you change them again.

**NOTE:**

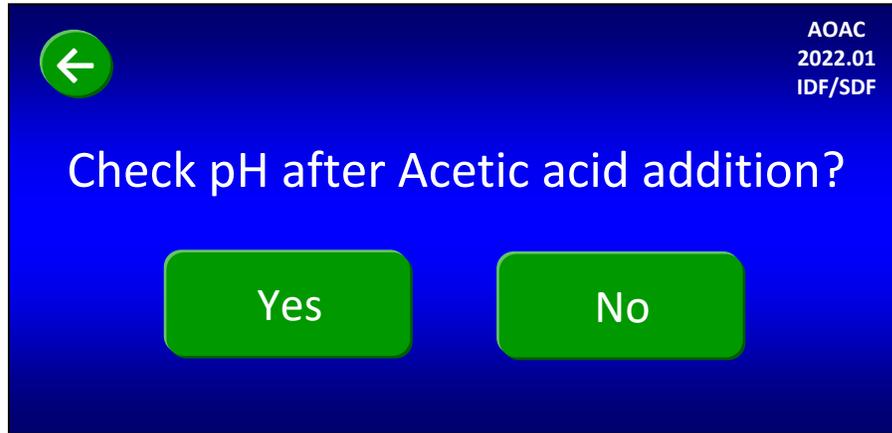
The initial filter times shown when you first run the instrument are based on factory experience. During filtration the computer allows you to bypass the filter time if you notice the filtering is complete. The computer also allows you to add time during filtering if needed (see the “Status Screen” section of the Operator’s Manual for more detail).

When all of the times shown on the screen are what you want, press the check mark (☑) button on the Touch Screen Display. The following screen will be displayed.



**20. Set the Manual pH checks.**

If you plan to check the pH after the required Trizma base is added (during the IDF process), press the “Yes” button on the screen above. Otherwise, press the “No” button. The following screen will be displayed.



If you plan to check the pH after the required Acetic acid is added (during the IDF process), press the “Yes” button on the screen above. Otherwise, press the “No” button. The following screen will be displayed.



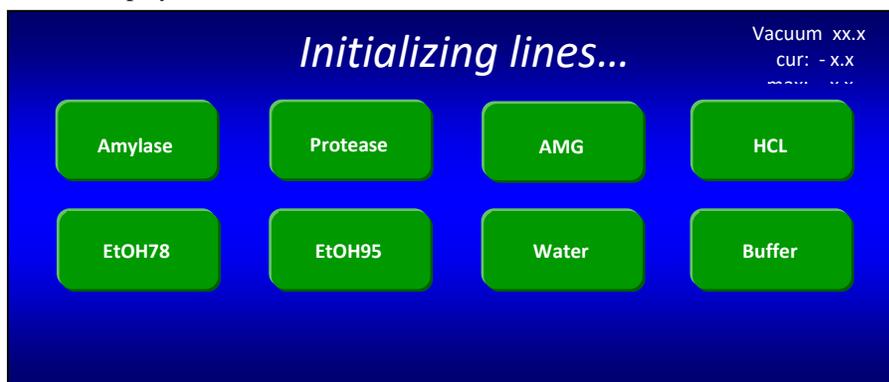
**21. Add Internal Standard now or tell the instrument to prompt you later.**

You can either add 1 ml of the Internal Standard (as per the AOAC 2022.01 method) before starting the instrument, or you can be prompted to add it after the pH checks. If you want to add it before starting the instrument, add it now to each IDF bag and press the “Yes” button. If you want to add it after the pH checks (during the IDF process), press the “No” button on the screen above and the instrument will prompt for the addition later. The following screen will be displayed.

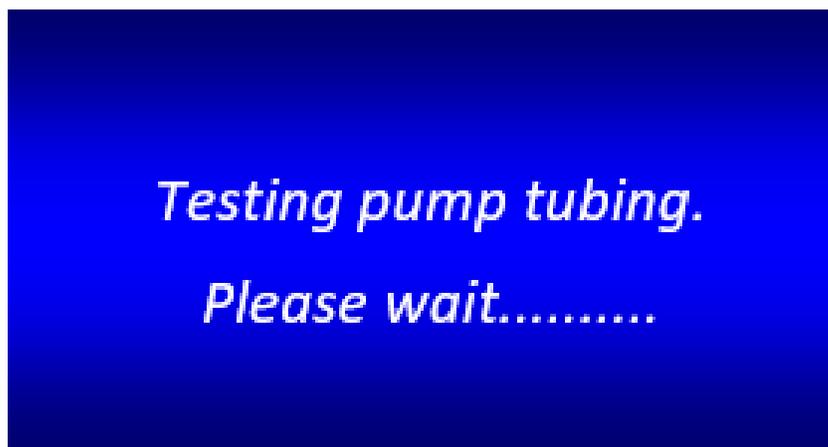
**22. Start the instrument.**

The instrument is now completely set up and ready to automatically run the IDF/SDF procedure. Press the “START” button to begin. At the beginning of each new run, the instrument automatically runs a tube integrity test.

For the first run after a power-up cycle, or for the first run after the instrument has been idle for twelve hours, the following status screen will be displayed.



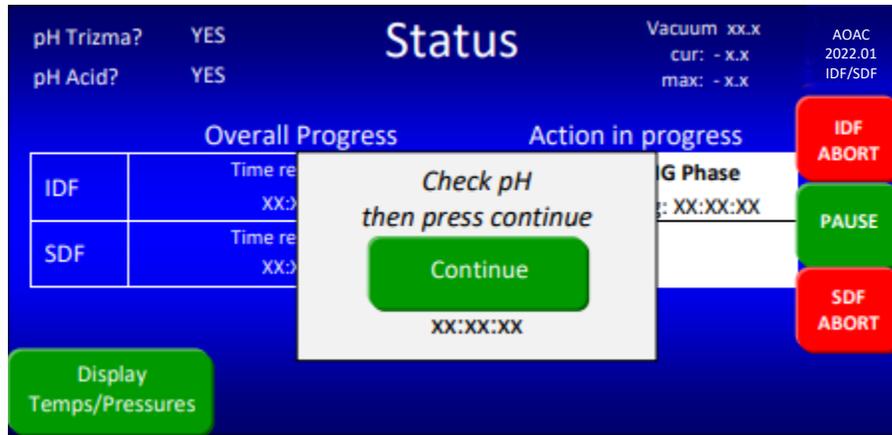
If the fluid lines are already charged properly, or when the line charge is complete, the following screen will be displayed.



When the tube integrity check is complete, the instrument will automatically execute the 4-hour digestion, the IDF filtration, the 60-minute precipitation, and the SDF filtration, adding all solutions as needed. The instrument will only stop for faults, aborts, manual pH measurement (if enabled), and internal standard addition (if enabled). The Status screen will show actions and faults as they occur during the automatic operation.

### 23. Manually measure pH after Trizma base addition.

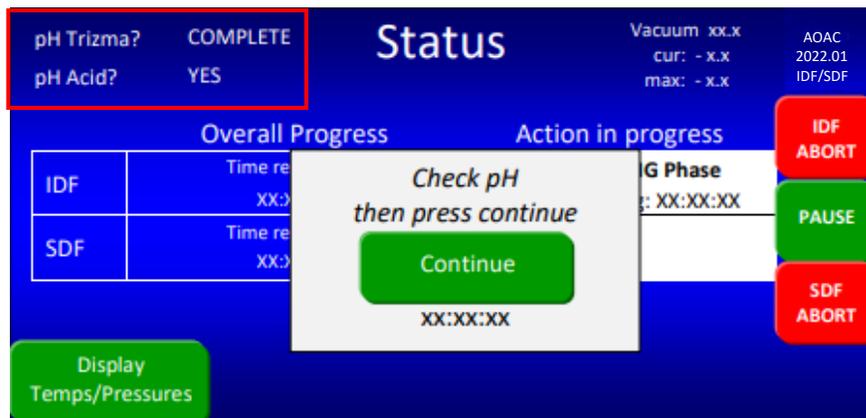
You are asked before starting the automated procedure if you want to check pH after the Trizma base addition. If you answered “Yes” to this question, the instrument will stop after adding the required Trizma, open Clamp Bar A, display the screen below, and make a sound to remind you to manually measure pH and adjust to 7.9 - 8.4 if necessary.



When measuring pH, use a probe that can be easily rinsed (with DI or DW Water) to avoid loss of sample. If you add acid or base to adjust the pH, you must mix the solution to get an accurate pH reading. To manually mix the solution, press the outside of the bag with your fingers just above Clamp Bar B multiple times.

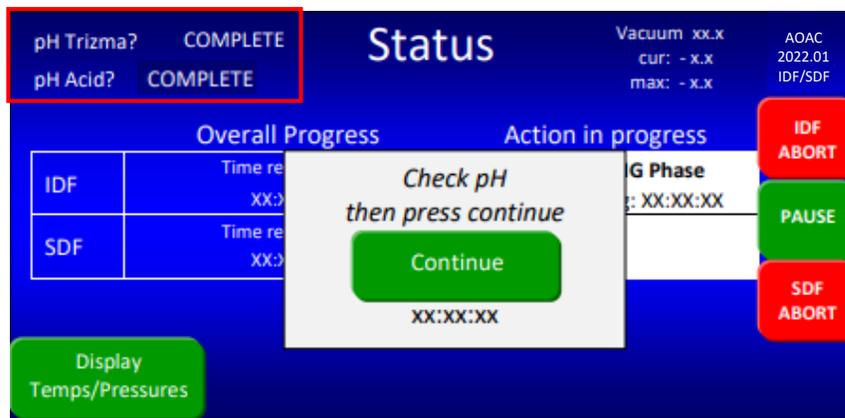


When you have completed the pH measurement process straighten each bag by lifting them back into place. Press the **Continue** button on the Status screen. You will see “COMPLETE” next to “pH Trizma?” in the upper left corner of the screen.



## 24. Manually measure pH after Acetic acid addition.

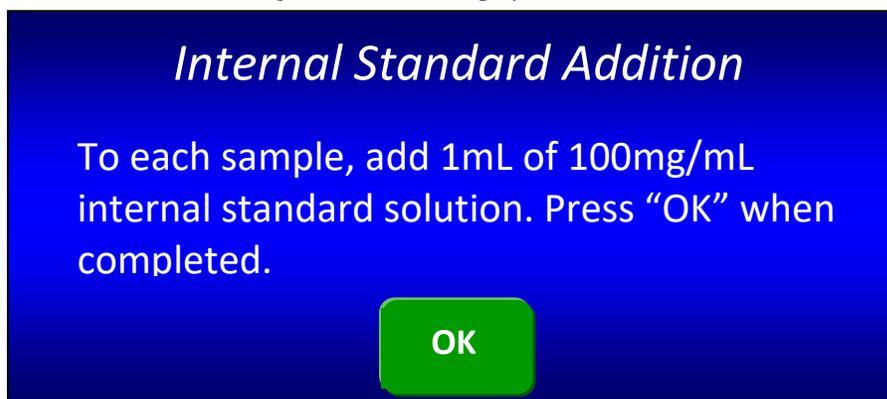
You are asked before starting the automated procedure if you want to check pH after the Acetic acid addition. If you answered “Yes” to this question, the instrument will stop after adding the required Acetic acid, open Clamp Bar A, display the screen below, and make a sound to remind you to manually measure pH and adjust to approximately 4.3 if necessary.



When you have completed the pH measurement process straighten each bag by lifting them back into place. Press the **Continue** button on the Status screen. You will see “COMPLETE” next to “pH Acid?” in the upper left corner of the screen.

## 25. Add Internal Standard (if not done during set-up).

If you did not add Internal Standard during the instrument set-up, after the instrument adds the Acetic acid and any manual pH modifications are made, the following screen will be displayed.



Add Internal Standard to the IDF bag; then press the “OK” button.

## 26. Rinse the IDF filter bags with acetone.

After the instrument has completed an IDF process, the IDF residue that has been collected in the IDF bag must be manually rinsed twice with acetone. It is recommended that you use an ANKOM TDF51 Rinse Stand (sold separately) for rinsing filter bags with acetone.

To rinse the IDF filter bags with acetone using the ANKOM TDF51 Rinse Stand, follow the steps below.

26.1 Remove the IDF bags from the instrument.

26.2 Place the bags on the Rinse Stand by sliding the back part of each bag under the pinch mechanism. Keep the top of the bag open.



26.3 Using a wash bottle, squirt acetone completely around the inside polypropylene surfaces of each bag two times, making sure that all residue is rinsed down into the filter.



26.4 After the two full rinses, target any sample still clinging to the walls of the bag with Acetone making sure all of the sample is pushed into the filter part of the bag.

26.5 Allow acetone to evaporate from the bags for 30-40 minutes.

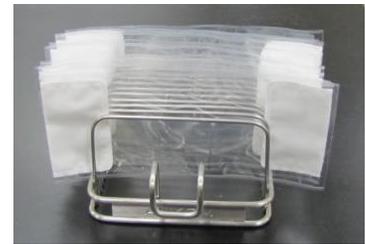


**Hazardous Materials** – Do NOT heat seal or place bags in an oven until all acetone has evaporated.

26.6 With your Heat Sealer (HS/HSi) set between 3 and 4 (settings may vary depending on the heat sealer and the power source), press the Heat Sealer arm down. **Hold the arm down for 3 to 4 seconds after the light goes out** to seal each bag just above the filter. This keeps all residue contained to the filter area while handling the bags.



26.7 Place each bag in the Drying Rack.



## 27. Rinse the SDF filter bags with acetone.

After the instrument has completed an SDF process, the SDF residue that has been collected in the SDF bag must be manually rinsed with acetone. It is recommended that you use an ANKOM TDF51 Rinse Stand for rinsing filter bags with acetone.

To rinse the SDF filter bags with acetone using the ANKOM TDF51 Rinse Stand, follow the steps below.

27.1 Remove the SDF bags from the instrument.

27.2 Place the bags on the Rinse Stand by sliding the back part of each bag under the pinch mechanism. Keep the top of the bag open.

27.3 Using a wash bottle, squirt acetone into each bag two times, making sure that all residue on the clear polypropylene surfaces is rinsed down into the filter.

27.4 After the two full rinses, target any sample still clinging to the walls of the bag with Acetone making sure all of the sample is pushed into the filter part of the bag.

27.5 Allow acetone to evaporate from the bags for 30-40 minutes.



**Hazardous Materials** – Do NOT heat seal or place bags in an oven until all acetone has evaporated.

27.6 Seal each bag just above the filter to keep all residue contained to the filter area while handling the bags.

**NOTE:**

Seal each bag as close to the filter as possible. This will allow you to trim the maximum amount of polypropylene from the bag before determining the protein content.

27.7 Place each bag in the Drying Rack.

**28. Dry the IDF and SDF filter bags.**

- 28.1 Make sure your oven is 105°C at the location where the bags will be placed.
- 28.2 Place the Drying Rack with the filter bags in the oven and dry to constant weight (a minimum of 90 minutes).
- 28.3 When dry, remove all filter bags from the oven and place the IDF and SDF bags in separate desiccant pouches (X45).

**29. Weigh the IDF residue.**

- 29.1 Remove only one IDF filter bag from the desiccant pouch at a time. (Close the desiccant bag after each bag is removed.)
- 29.2 Roll or fold the bag, place it in a tared Bag Weigh Holder, and place the Bag Weigh Holder in the center of a scale.
- 29.3 Record the weight of the filter bag.
- 29.4 Repeat previous steps for each IDF filter bag used in the fiber analysis.

**30. Weigh the Water Soluble, Water: Alcohol Insoluble Dietary Fiber (WSWAIDF) residue.**

- 30.1 Remove only one SDF filter bag from the desiccant pouch at a time. (Close the desiccant bag after each bag is removed.)
- 30.2 Roll or fold the bag, place it in a tared Bag Weigh Holder, and place the Bag Weigh Holder in the center of a scale.
- 30.3 Record the weight of the filter bag.
- 30.4 Repeat previous steps for each SDF filter bag used in the fiber analysis.

**31. Determine the Protein content within the IDF and WSWAIDF residue.**

See the “Protein Determination” section of the TDF Operator’s Manual for recommended procedures.

**32. Determine the Ash content within the IDF and WSWAIDF residue.**

See the “Ash Determination” section of the TDF Operator’s Manual for recommended procedures.

**33. Determine the Water: Alcohol Soluble Dietary Fiber (WASDF)**

Using the filtrate in the instrument Filtrate Cups, determine the WASDF according to the approved method.

**34. Calculate the % IDF value.**

% IDF	=	$\left[ \frac{[(R_1 + R_2)/2] - P - A - B}{(M_1 + M_2)/2} \right]$	X 100
	=	$\left[ \frac{[((f_{F1} - f_{S1}) + (f_{F2} - f_{S2}))/2] - P - A - B}{(M_1 + M_2)/2} \right]$	X 100
Where:	M <sub>1</sub> , M <sub>2</sub>	=	Original wt of duplicate samples adjusted for pre-treatment fat and sugar losses (g)
	R <sub>1</sub> , R <sub>2</sub>	=	Residue for duplicate samples (g)
	f <sub>F</sub>	=	Final Filter Bag with residue (g)
	f <sub>S</sub>	=	Initial Filter Bag (g)
	P	=	Protein of residue and bag (g)
	A	=	Ash of residue and bag (g)
	B	=	Blank (g)
		=	$[(BR_1 + BR_2)/2] - P_B - A_B$
		=	$[(f_{BF1} - f_{BS1}) + (f_{BF2} - f_{BS2}))/2] - P_B - A_B$
	BR <sub>1</sub> , BR <sub>2</sub>	=	Residue for duplicate blanks (g)
	f <sub>BF</sub>	=	Final Blank Filter Bag (g)
	f <sub>BS</sub>	=	Initial Blank Filter Bag (g)
	P <sub>B</sub>	=	Protein of Blank Filter Bag (g)
	A <sub>B</sub>	=	Ash of Blank Filter Bag (g)

35 Calculate the % SDF value.

% SDF	=	% WSWAIDF + % WASDF
	=	$\left( \left[ \frac{[(R_1 + R_2)/2] - P - A - B}{(M_1 + M_2)/2} \right] \times 100 \right) + \% \text{ WASDF}$
	=	$\left( \left[ \frac{[(f_{F1} - f_{S1} - D_1) + (f_{F2} - f_{S2} - D_2)]/2 - P_1 - (A_2 - D_2) - B}{(M_1 + M_2)/2} \right] \times 100 \right) + \% \text{ WASDF}$
Where:	M <sub>1</sub> , M <sub>2</sub>	= Original wt of duplicate samples adjusted for pre-treatment fat losses (g)
	R <sub>1</sub> , R <sub>2</sub>	= Residue for duplicate samples (g)
	f <sub>F</sub>	= Final Filter Bag with residue (g)
	f <sub>S</sub>	= Initial Filter Bag (g)
	D	= Original wt of Diatomaceous Earth (g)
	P	= Protein of residue and bag (g)
	A	= Ash of residue and bag (g)
	B	= Blank (g)
		= $[(BR_1 + BR_2)/2] - P_B - (A_B - D_B)$
		= $[(f_{BF1} - f_{BS1} - D_{B1}) + (f_{BF2} - f_{BS2} - D_{B2})]/2 - P_{B1} - (A_{B2} - D_{B2})$
	BR <sub>1</sub> , BR <sub>2</sub>	= Residue for duplicate blanks (g)
	f <sub>BF</sub>	= Final Blank Filter Bag (g)
	f <sub>BS</sub>	= Initial Blank Filter Bag (g)
	P <sub>B</sub>	= Protein of Blank Filter Bag (g)
	A <sub>B</sub>	= Ash of Blank Filter Bag (g)
	D <sub>B</sub>	= Original wt of Diatomaceous Earth in Blank Filter Bag (g)
	WASDF	= Soluble Dietary Fiber determined by HPLC

36 Calculate the % TDF value by adding the % IDF and the % SDF values.

37 Crystallization of TRIZMA Base in the silicone tubing can happen overnight and will cause a fault during a run the next day. To prevent this, it is necessary to flush this line out at the end of each day that the instrument has been used. Please see Appendix C for the flush procedure.

## TDF Analysis (AOAC 2017.16)

A TDF analysis directly measures the amount of TDF within a given sample without measuring the IDF and SDF fractions. This analysis requires a filter bag for the precipitation process and a non-filter IDF *Flow-Thru* bag for the digestion process. When starting a new run, the ANKOM<sup>TDF</sup> Dietary Fiber Analyzer must have bags installed at all stations (a total of twelve bags).

**NOTE:**

To enhance the productivity of your instrument, you can begin the IDF process for a new run while the SDF process of a previous run is finishing. See the “Productivity Enhancement” section of your ANKOM<sup>TDF</sup> Dietary Fiber Analyzer Operator’s Manual for more details.

To perform a TDF analysis, follow the steps below.

### 1. Prepare chemicals and enzymes.

When using the ANKOM<sup>TDF</sup> Dietary Fiber Analyzer for the AOAC 2017.16 method, use the chemicals and enzymes referred to therein. See Appendix A of this manual for the list of chemicals and enzymes and the instructions for how to prepare them for use in this instrument.

**IMPORTANT:**

In order to prevent any TRIZMA base from crystallizing in the silicone tubing and causing blockages, it is very important to flush this enzyme line at the end of each day that the instrument is used. Refer to Appendix C.

### 2. For samples that have a fat content of 10% or higher, de-fat your samples as needed according to the official methods or your internal SOPs.

### 3. Label the filter bags using a Solvent Resistant Marker.

IDF *Flow-thru* Bag  
(shorter bag no filter)



SDF Bag  
(longer bag with filter)

### 4. Prepare for data collection.

You will need a place to store the data collected during this analysis. For your convenience, a USB Flash drive was included with the instrument and includes a Calculation Template that can be used for this analysis. Please read the “Instructions” tab in the MS-Excel file for information about the spreadsheets.

### 5. Weigh SDF bags.

**IMPORTANT:**

Using a Bag Weigh Holder is critical to eliminate the effects of static electricity during the weighing process.

Roll or fold each bag and place it in a tared Bag Weigh Holder. Place the Bag Weigh Holder in the center of a balance and record the weight.



**NOTE:**

Because different balances have different sensitivities, the Bag Weigh Holder should be placed in the center of the balance for best results.

**6. Weigh Diatomaceous Earth (DE).**

DE is used during fiber analysis to enhance the flocculation and filtration of the SDF fraction. Place ca 1g ± 0.05g of DE in each of the six tared and numbered tins/weigh boats and record the weights.

**7. Weigh Samples.**

Place 0.5± 0.05g of sample in each of the six tared and numbered tins/weigh boats and record the weights.

**NOTE:** A larger sample (1.0g) can be used to improve precision if necessary.

**8. Confirm Nitrogen Supply and Pressure Ranges.**

Make sure the Nitrogen supply in your lab is connected to the instrument and turned on. The High-Pressure Gauge on the left of the instrument should be set between 50-55 psi. The Low-Pressure Gauge on the right side of the instrument should be set at 4 psi. The accuracy of the Low-Pressure Gauge should be checked prior to each run by pressing the “Pressurize SDF” button on the control panel twice.



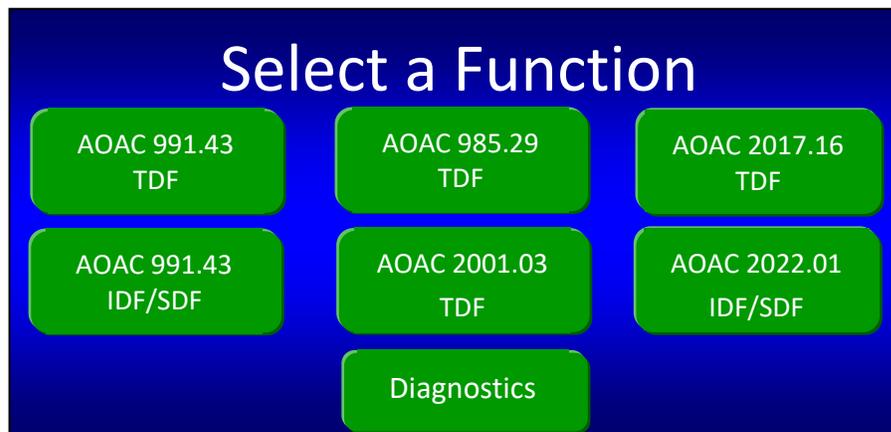
**9. Turn the instrument power on.**

When you turn the power on, the instrument will run through an initialization process and the Control Panel will turn on.

**10. On the Touch Screen Display, select the instrument function you would like to perform.**

The Control Panel on the ANKOM<sup>TDF</sup> Dietary Fiber Analyzer uses Touch Screen technology. To operate the instrument, you will press identified buttons on the Touch Screen Display and buttons below the screen.

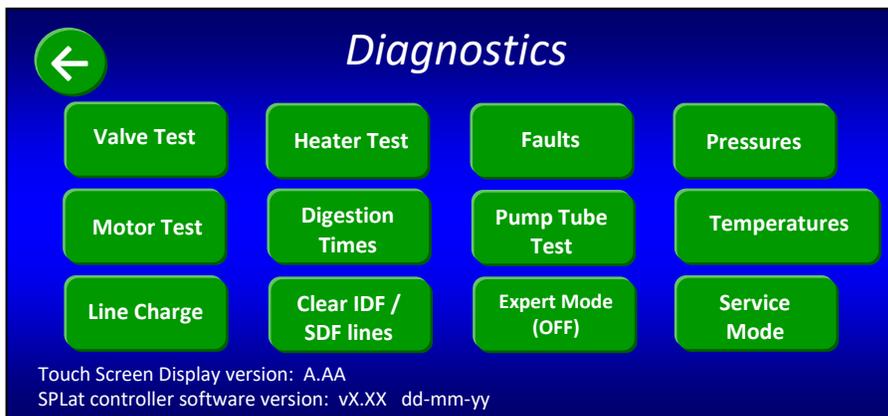
When your instrument is initialized and ready to operate, the following screen will be displayed.



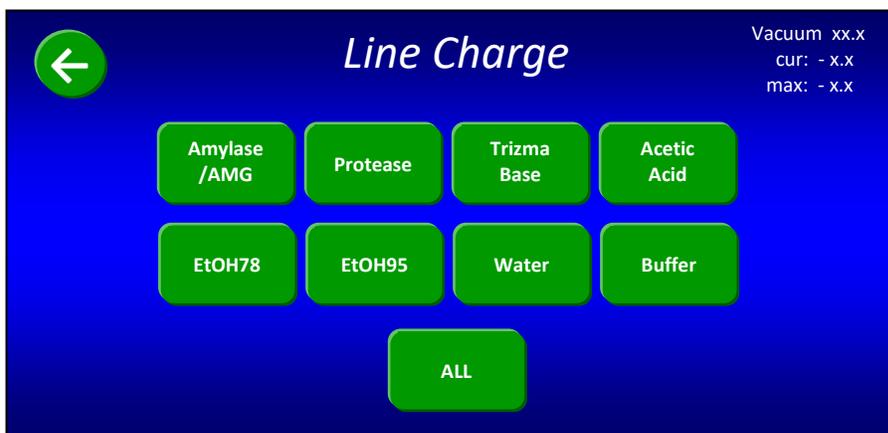
**NOTE:** Although the instrument works in accordance with the AACC 32-60.01 method, the Touch Screen Display only refers to the AOAC methods.

10.1 If this is the first time the instrument is being operated after installation, or if this is the first time the instrument is being operated after sitting unused for a period of time and was flushed according to Appendix C, the lines must be charged to avoid the faults: E13 (Tubing Failure) or E14 (Empty Chemical Container). To charge the lines follow the steps below.

10.1.1 Press the “Diagnostics” button on the “Select a Function” screen. The following screen will be displayed.

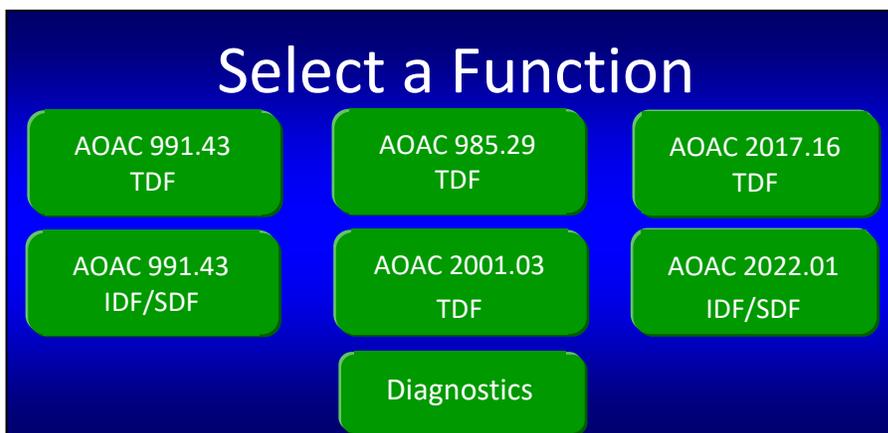


10.1.2 Press the “Line Charge” button. The following screen will be displayed.



10.1.3 Press the “ALL” button to charge all of the lines. Each button will change color as the associated line is being charged. All lines are charged when all of the buttons return to their original green color.

10.1.4 Press the back  button twice. The following “Select a Function” screen will be displayed again.



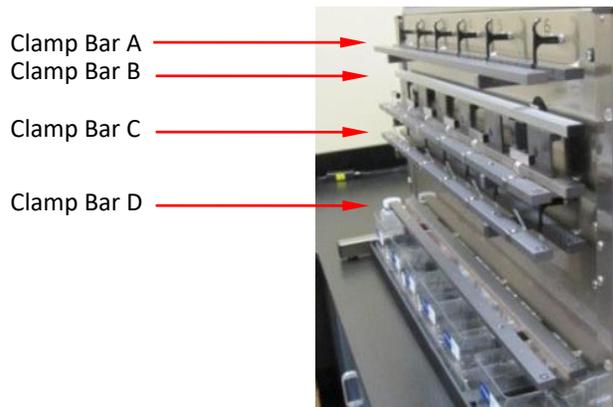
10.2 Press the “AOAC 2017.16 TDF” button. The following screen will be displayed.



Notice that the function you selected is now displayed in the top right corner of the screen and a back  button is displayed in the top left corner of the screen.

**11. Install SDF filter bags on the ANKOM<sup>TDF</sup> Dietary Fiber Analyzer.**

11.1 Remove Clamp Bars A, B, C, and D by lifting them off of the locator rods.



11.2 Gently pull the black SDF Delivery Nozzle out toward you



- 11.3 Place a labeled and weighed SDF bag up underneath the SDF Delivery Nozzle so that the Delivery Nozzle is inside the top part of the bag. Pull the bag up so that the top of the bag is about 35 mm (1.375 inches) above the top of Clamp Bar C and return the Delivery Nozzle to its original position. This will hold the back of the bag in place.



**IMPORTANT:**

As part of normal operation, solution from the IDF *Flow-thru* bag will flow into the SDF bag. Therefore, when installing the SDF filter bags it is very important to position them high enough vertically so that at least 20 mm (0.75 inches) of the bottom of the IDF *Flow-thru* bag can fit inside the top of the SDF bag.

- 11.4 With the bag being held by the Delivery Nozzle, center it horizontally between the lines on the back part of Clamp Bar C.

Centering Lines



- 11.5 Repeat previous steps for all six stations.  
 11.6 Re-install Clamp Bar D by setting it on the locator rods. Make sure the letter is on the top of the bar and the rubber material is facing in toward the instrument.  
 11.7 Flatten the bags to remove any wrinkles.  
 11.8 With fingers away from the clamp bars, press the check mark (☑) button on the Touch Screen Display to pinch the bags just above the filter. The following screen will be displayed.



**12. Add DE to the SDF filter bags on the ANKOM<sup>TDF</sup> Dietary Fiber Analyzer.**

12.1 Open the top of the SDF bag and add a weigh tin/weigh boat of DE to the bag by folding the tin and then dipping it down into the bag below the tip of the Delivery Nozzle.

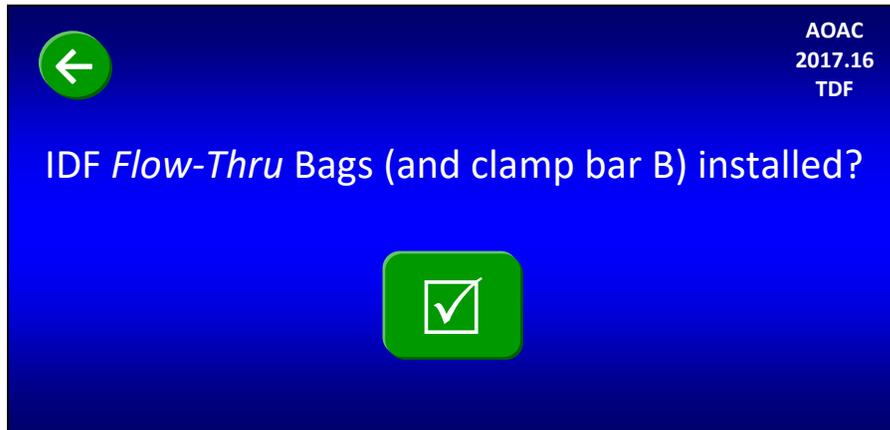


**IMPORTANT:** When adding DE to the filter bags it is very important to keep it below the tip of the Delivery Nozzle so that the DE material can be properly rinsed.

12.2 Rinse the weigh tin/weigh boat with 78% EtOH to ensure complete transfer.

12.3 Repeat previous steps for all six stations.

12.4 Press the check mark (☑) button on the Touch Screen Display. The following screen will be displayed.



**NOTE:** After you confirm that the DE is added, the Clamp Bar D button on the Control Panel is disabled until the SDF process completes.

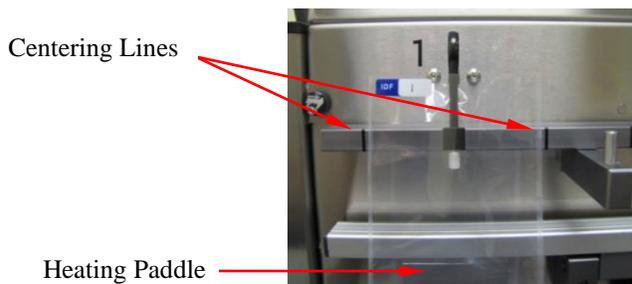
**13. Install IDF *Flow-thru* bags on the ANKOM<sup>TDF</sup> Dietary Fiber Analyzer.**

13.1 Gently pull the black IDF Delivery Nozzle out toward you.



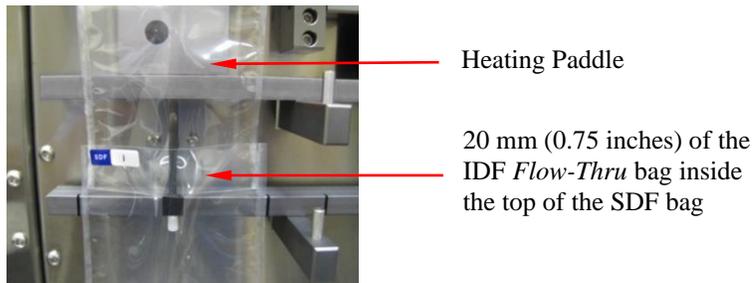
13.2 Place a labeled IDF *Flow-Thru* bag up underneath the Delivery Nozzle so that the Delivery Nozzle is inside the top part of the bag. Pull the bag up so that the top of the bag is about 35 mm (1.375 inches) above the top of Clamp Bar A and return the Delivery Nozzle to its original position. This will hold the back of the bag in place.

13.3 With the bag held by the Delivery Nozzle, center it horizontally between the Centering Lines on the back part of Clamp Bar A.



**IMPORTANT:** For proper mixing during the IDF process the IDF *Flow-thru* bags must be horizontally centered over the Heating Paddles and between the Centering Lines on the back part of Clamp Bar A.

13.4 Place at least 20 mm (0.75 inches) of the bottom of the IDF *Flow-Thru* bag inside the top of the SDF bag to allow for the flow of solution into the SDF bag after the digestion process is complete.



- 13.5 Repeat previous steps for all six stations.
- 13.6 Re-install Clamp Bar B by setting it on the locator rods. Make sure the letter is on the top of the bar and the rubber material is facing in toward the instrument.
- 13.7 Flatten the IDF *Flow-Thru* bags to remove any wrinkles.
- 13.8 With fingers away from the clamp bars, press the check mark (☑) button on the Touch Screen Display to pinch the IDF *Flow-Thru* bags. The mixing pads will make contact with the bags when Clamp Bar B pinches the IDF *Flow-Thru* bags. The following screen will be displayed.



**14. Add samples to the IDF *Flow-thru* bags.**

- 14.1 Open the top of the IDF *Flow-thru* bag and transfer the sample from the #1 weigh tin/weigh boat into the bag by folding the tin and then dipping it down into the bag below the tip of the Delivery Nozzle.

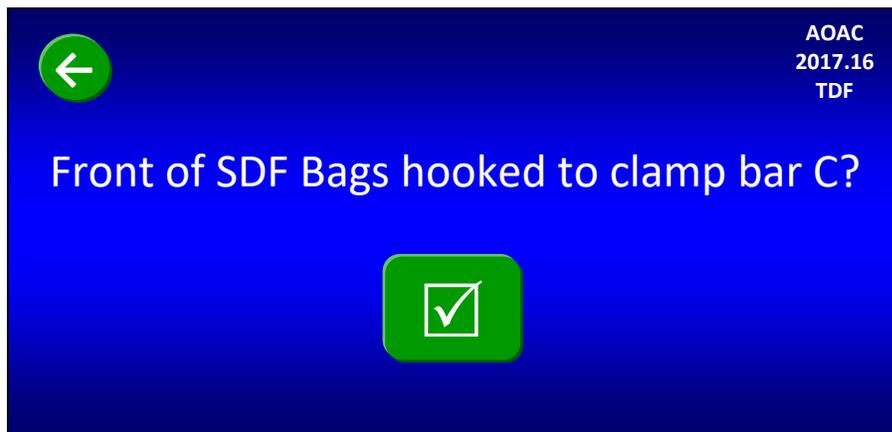


**IMPORTANT:** When adding sample to the IDF *Flow-thru* bags it is very important to keep it below the tip of the Delivery Nozzle so that it can be properly rinsed.

- 14.2 Rinse the weigh tin/weigh boat with no more than 3 ml of Deionized or Distilled Water to ensure complete transfer.
- 14.3 Repeat previous steps for all IDF stations.
- 14.4 Re-install Clamp Bar A by setting it on the locator rods. Make sure the letter is on the top of the bar and the rubber material is facing in toward the instrument.
- 14.5 Press the check mark (☑) button on the Touch Screen Display. The following screen will be displayed.



- 14.6 Make sure that all clamp bars are installed with the letter on the top of the bar and the rubber gasket facing in toward the instrument. Press the check mark (☑) button on the Touch Screen Display. The following screen will be displayed.



**15. Hook the front of the SDF bag in place.**

15.1 Secure the front of the SDF onto the hooks located on the front part of Clamp Bar C by pulling up the middle section of the front of the filter bag evenly and tightly, lean the bag against the hook as the bag is lowered, allowing the bag to catch onto the hook. There should be at least a 1/4" of the top of the bag sitting above the hook.



Hook on front part of Clamp Bar C

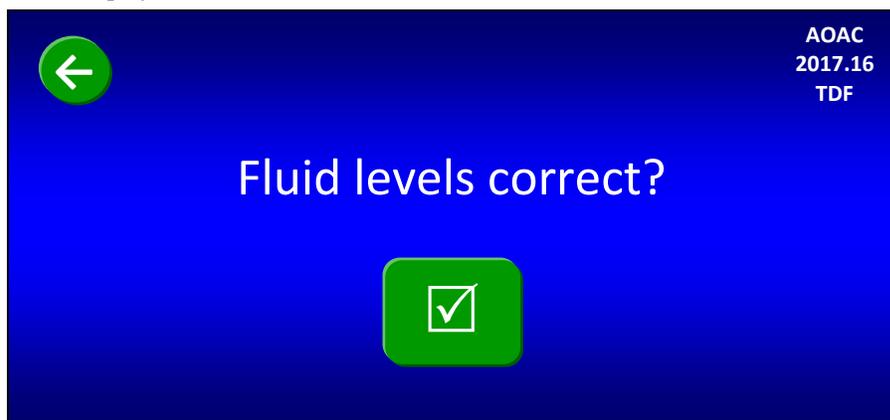
**NOTE:** Hooking the bags in place will put a physical hole in the front of each SDF bag.

15.2 Press the check mark (☑) button on the Touch Screen Display. The following screen will be displayed.



**16. Verify that the fluid containers are correct for this procedure.**

Verify that the fluid supply containers are configured according to the screen above and press the check mark (☑) button. The following screen will be displayed.



### 17. Fill fluid containers.

To ensure that you have enough fluids to run a complete TDF procedure, you must begin with at least 25 ml of the Amylase/AMG mixture, 15 ml of Protease, 25 ml of Trizma Base, and fluid levels above the Minimum Level lines on the remaining chemical containers. Add fluids and enzymes as necessary.

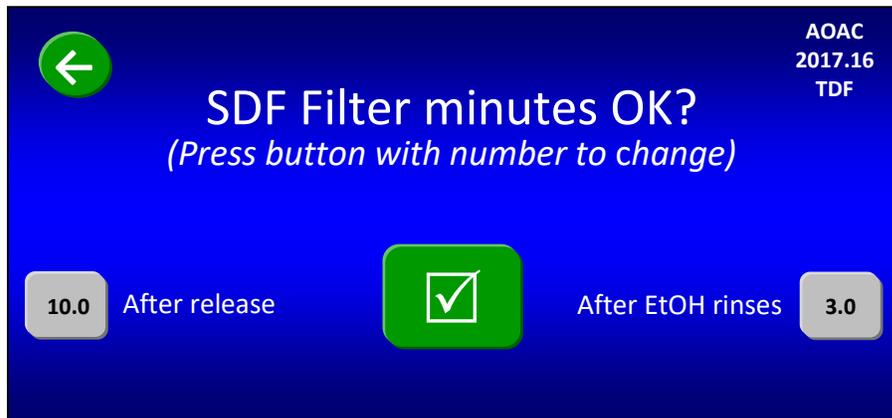
With all fluid containers filled to the proper levels, press the check mark (☑) button on the Touch Screen Display. The following screen will be displayed.



### 18. Confirm the Nitrogen Supply Settings.

Confirm the high-pressure gauge on the left of the instrument shows 50-55 psi. The low-pressure gauge on the right side of the instrument should be set at 4 psi.

Press the check mark (☑) button on the Touch Screen Display. The following screen will be displayed.



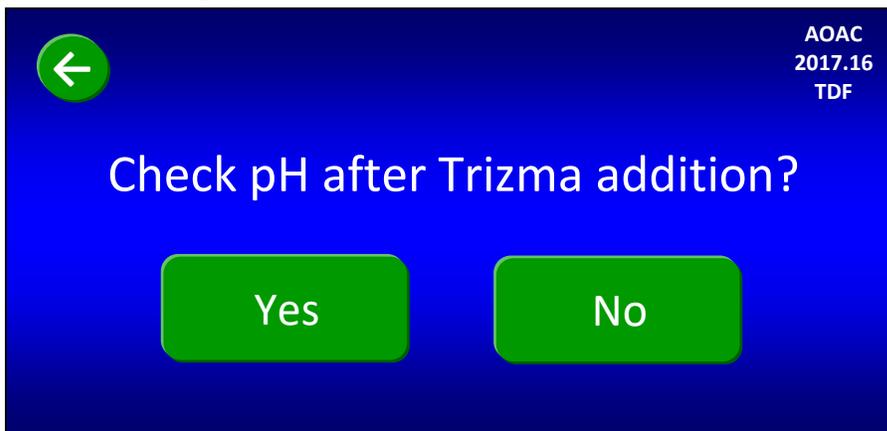
### 19. Set filter times (in minutes).

Because different samples take different amounts of time to filter, the above screen allows you to set your filter times. To change any of the times shown on the screen, press the specific gray button. A number pad will be displayed that will allow you to enter the time that you want. The times you enter will remain until you change them again.

**NOTE:**

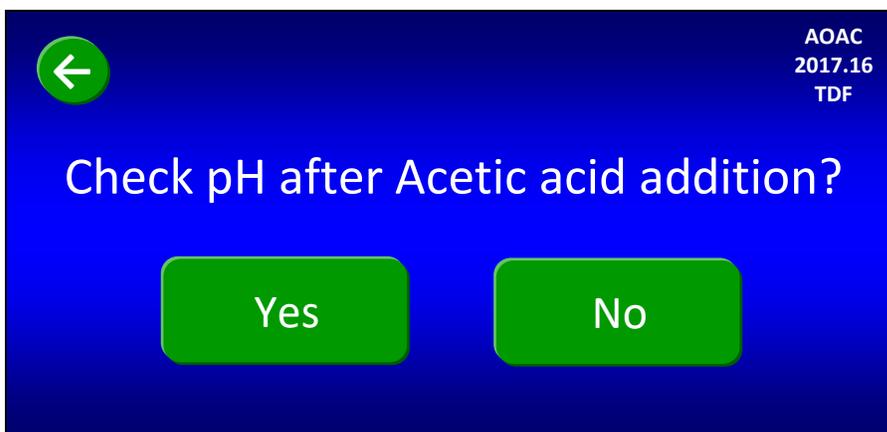
The initial filter times shown when you first run the instrument are based on factory experience. During filtration the computer allows you to bypass the filter time if you notice the filtering is complete. The computer also allows you to add time during filtering if needed (see the “Status Screen” section of the Operator’s Manual for more detail).

When all of the times shown on the screen are what you want, press the check mark (☑) button on the Touch Screen Display. The following screen will be displayed.



## 20. Set the Manual pH checks.

If you plan to check the pH after the required Trizma base is added (during the IDF process), press the “Yes” button on the screen above. Otherwise, press the “No” button. The following screen will be displayed.



If you plan to check the pH after the required Acetic acid is added (during the IDF process), press the “Yes” button on the screen above. Otherwise, press the “No” button. The following screen will be displayed.



**21. Add Internal Standard now or tell the instrument to prompt you later.**

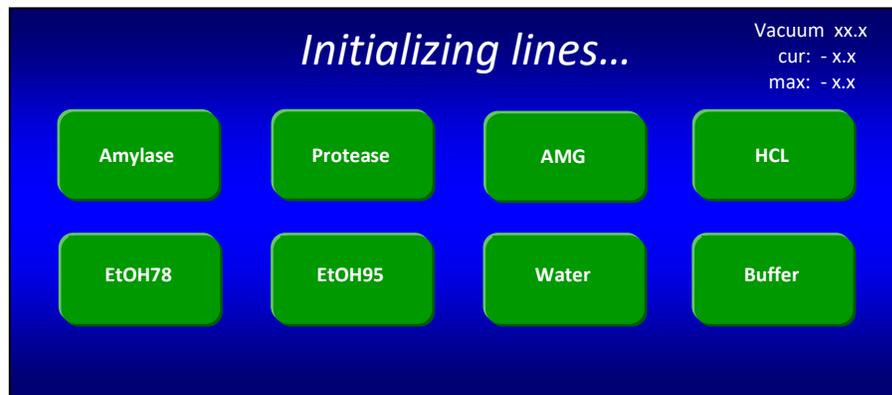
You can either add 1 ml of the Internal Standard (as per the AOAC 2017.16 method) before starting the instrument, or you can be prompted to add it after the pH checks. If you want to add it before starting the instrument, add it now to each IDF *Flow-thru* bag and press the “Yes” button. If you want to add it after the pH checks (during the IDF process), press the **No** button on the screen above and the instrument will prompt for the addition later. The following screen will be displayed.



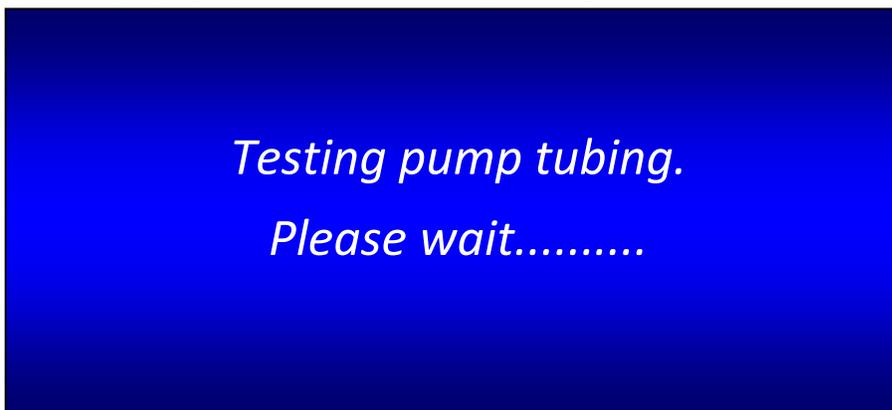
**22. Start the instrument.**

The instrument is now completely set up and ready to automatically run the TDF procedure. Press the “START” button to begin. At the beginning of each new run, the instrument automatically runs a tube integrity test.

For the first run after a power-up cycle, or for the first run after the instrument has been idle for twelve hours, the following status screen will be displayed.



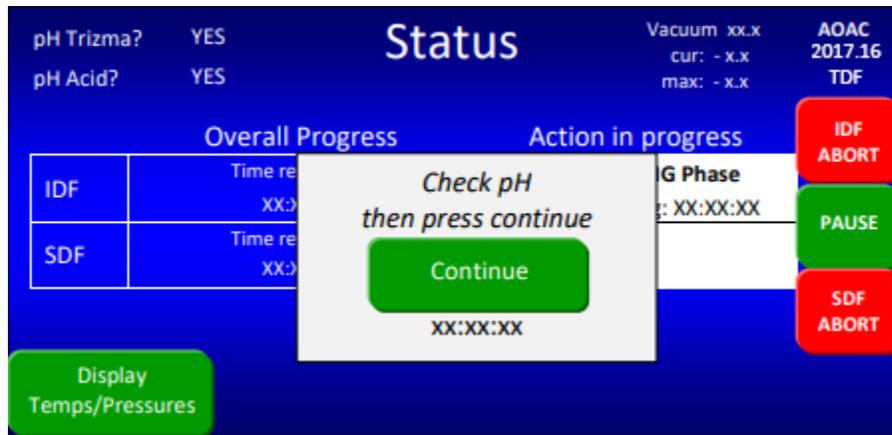
If the fluid lines are already charged properly, or when the line charge is complete, the following screen will be displayed.



When the tube integrity check is complete, the instrument will automatically execute the 4-hour digestion, the 60-minute precipitation, and the filtration, adding all solutions as needed. The instrument will only stop for faults, aborts, manual pH measurement (if enabled), and internal standard addition (if enabled). The Status screen will show actions and faults as they occur during the automatic operation.

**23. Manually measure pH after Trizma base addition.**

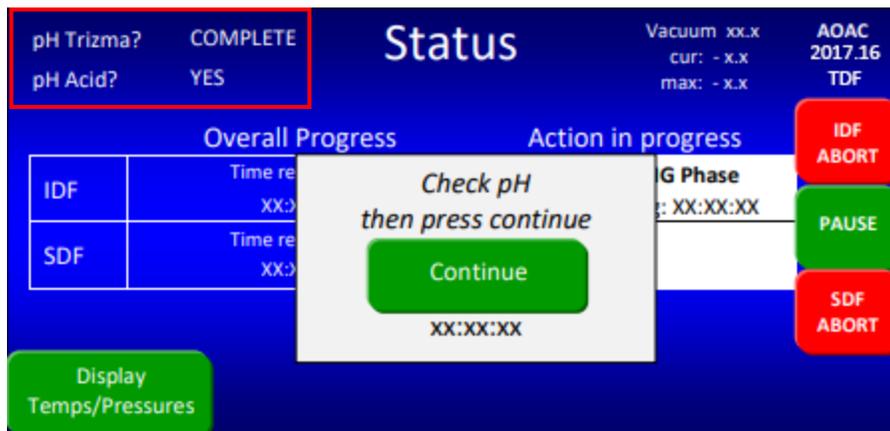
You are asked before starting the automated procedure if you want to check pH after the Trizma base addition. If you answered “Yes” to this question, the instrument will stop after adding the required Trizma, open Clamp Bar A, display the screen below, and make a sound to remind you to manually measure pH and adjust to 7.9 - 8.4 if necessary.



When measuring pH, use a probe that can be easily rinsed (with DI or DW Water) to avoid loss of sample. If you add acid or base to adjust the pH, you must mix the solution to get an accurate pH reading. To manually mix the solution, press the outside of the bag with your fingers just above Clamp Bar B multiple times.

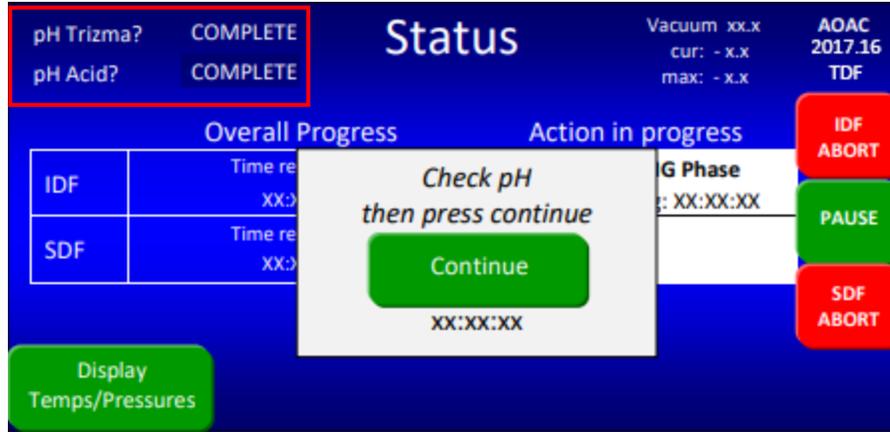


When you have completed the pH measurement process straighten each bag by lifting them back into place. Press the “Continue” button on the Status screen. You will see “COMPLETE” next to “pH Trizma?” in the upper left corner of the screen.



**24. Manually measure pH after Acetic acid addition.**

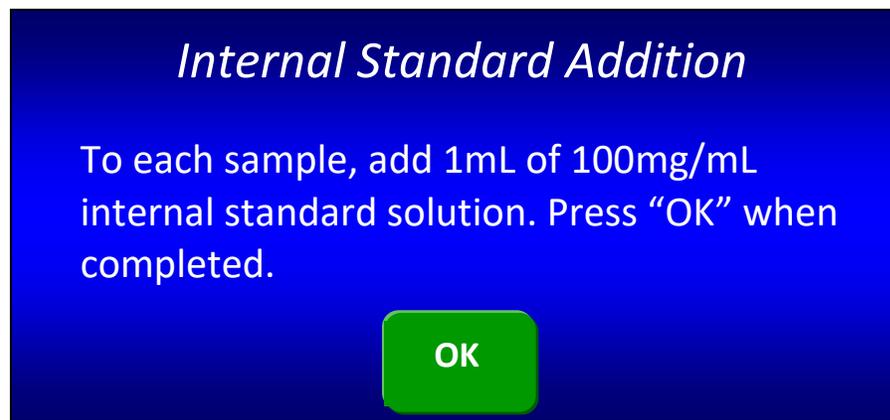
You are asked before starting the automated procedure if you want to check pH after the Acetic acid addition. If you answered “Yes” to this question, the instrument will stop after adding the required Acetic acid, open Clamp Bar A, display the screen below, and make a sound to remind you to manually measure pH and adjust to approximately 4.3 if necessary.



When you have completed the pH measurement process straighten each bag by lifting them back into place. Press the **Continue** button on the Status screen. You will see “COMPLETE” next to “pH Acid?” in the upper left corner of the screen.

**25. Add Internal Standard (if not done during set-up).**

If you did not add Internal Standard during the instrument set-up, after the instrument adds the Acetic acid and any manual pH modifications are made, the following screen will be displayed.



Add Internal Standard to the IDF *Flow-Thru* bag; then press the “OK” button.

**26. Make sure that each sample is completely rinsed down into the SDF filter bags (as needed).**

Since the IDF *Flow-thru* bags are not weighed before and after the process, it is important to make sure that each sample gets rinsed down to the SDF filter bag when the digestion process is complete. This is especially important for sticky samples.

If you notice sample sticking to an IDF *Flow-thru* bag, use 78% EtOH in a wash bottle to rinse as needed. Once all of the sample is rinsed down from the IDF *Flow-thru* bags, they can be disposed of.

## 27. Rinse the SDF filter bags with acetone.

After the instrument has completed a TDF process the TDF residue that has been collected in the SDF bag must be manually rinsed with acetone. It is recommended that you use an ANKOM TDF51 Rinse Stand for rinsing filter bags with acetone.

To rinse the SDF filter bags with acetone using the ANKOM TDF51 Rinse Stand, follow the steps below.

- 27.1 Remove the SDF bags from the instrument.
- 27.2 Place the bags on the Rinse Stand by sliding the back part of each bag under the pinch mechanism. Keep the top of the bag open.
- 27.3 Using a wash bottle, squirt acetone completely around the inside polypropylene surfaces of each bag two times, making sure that all residue is rinsed down into the filter.
- 27.4 After the two full rinses, target any sample still clinging to the walls of the bag with Acetone making sure all of the sample is pushed into the filter part of the bag.
- 27.5 Allow acetone to evaporate from the bags for 30-40 minutes.



**Hazardous Materials** – Do NOT heat seal or place bags in an oven until all acetone has evaporated.

- 27.6 With your Heat Sealer (HS/HSi) set between 3 and 4 (settings may vary depending on the heat sealer and the power source), press the Heat Sealer arm down. **Hold the arm down for 3 to 4 seconds after the light goes out** to seal each bag just above the filter. This keeps all residue contained to the filter area while handling the bags.



### NOTE:

Try to seal each bag as close to the filter as possible. This will allow you to trim the maximum amount of polypropylene from the bag before determining the protein content.

- 27.7 Place each bag in the Drying Rack.



## 28. Dry the SDF filter bags.

- 28.1 Make sure your oven is 105°C at the location where the bags are placed.
- 28.2 Place the Drying Rack with the filter bags in the oven and dry to constant weight (a minimum of 90 minutes).
- 28.3 When dry, remove all filter bags from the oven and place the IDF and SDF bags in separate desiccant pouches (X45).

**29. Weigh the Water Soluble, Water: Alcohol Insoluble Dietary Fiber (WSWAIDF) residue.**

- 29.1 Remove only one SDF filter bag from the desiccant pouch at a time. (Close the desiccant bag after each bag is removed.)
- 29.2 Roll or fold the bag, place it in a tared Bag Weigh Holder, and place the Bag Weigh Holder in the center of a scale.
- 29.3 Record the weight of the filter bag.
- 29.4 Repeat previous steps for each SDF filter bag used in the fiber analysis.

**30. Determine the Protein content within the WSWAIDF residue.**

See the “Protein Determination” section of the TDF Operator’s Manual for recommended procedures.

**31. Determine the Ash content within the WSWAIDF residue.**

See the “Ash Determination” section of the TDF Operator’s Manual for recommended procedures.

**32. Determine the Water: Alcohol Soluble Dietary Fiber (WASDF)**

Using the filtrate in the instrument Filtrate Cups, determine the WASDF according to the approved method.

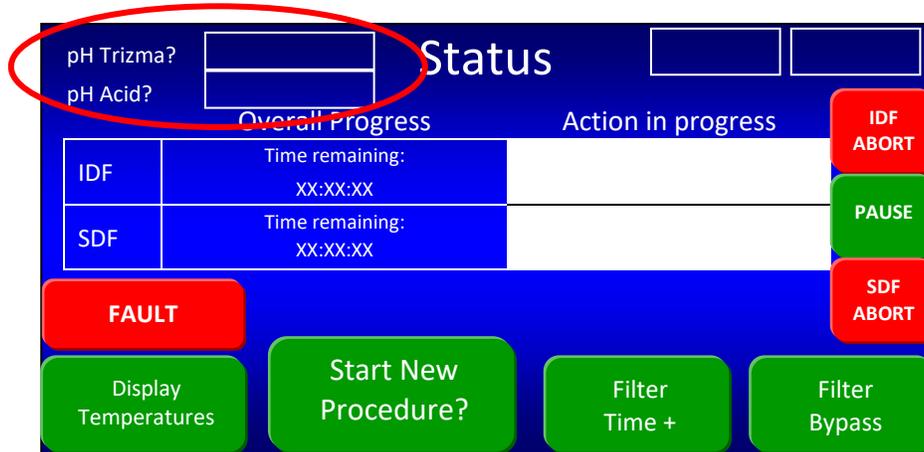
**33. Calculate the % TDF value.**

<b>% TDF</b>	= % WSWAIDF + % WASDF																																		
	= $\left( \left[ \frac{[(R_1 + R_2)/2] - P - A - B}{(M_1 + M_2)/2} \right] \times 100 \right) + \% \text{ WASDF}$																																		
	= $\left( \left[ \frac{[(f_{F1} - f_{S1} - D_1) + (f_{F2} - f_{S2} - D_2)]/2 - P_1 - (A_2 - D_2) - B}{(M_1 + M_2)/2} \right] \times 100 \right) + \% \text{ WASDF}$																																		
<b>Where:</b>	<table style="width: 100%; border: none;"> <tr> <td style="width: 10%;"><math>M_1, M_2</math></td> <td>= Original wt of duplicate samples adjusted for pre-treatment fat losses (g)</td> </tr> <tr> <td><math>R_1, R_2</math></td> <td>= Residue for duplicate samples (g)</td> </tr> <tr> <td><math>f_F</math></td> <td>= Final Filter Bag with residue (g)</td> </tr> <tr> <td><math>f_S</math></td> <td>= Initial Filter Bag (g)</td> </tr> <tr> <td><math>D</math></td> <td>= Original wt of Diatomaceous Earth (g)</td> </tr> <tr> <td><math>P</math></td> <td>= Protein of residue and bag (g)</td> </tr> <tr> <td><math>A</math></td> <td>= Ash of residue and bag (g)</td> </tr> <tr> <td><math>B</math></td> <td>= Blank (g)</td> </tr> <tr> <td></td> <td>= <math>[(BR_1 + BR_2)/2] - P_B - (A_B - D_B)</math></td> </tr> <tr> <td></td> <td>= <math>[(f_{BF1} - f_{BS1} - D_{B1}) + (f_{BF2} - f_{BS2} - D_{B2})]/2 - P_{B1} - (A_{B2} - D_{B2})</math></td> </tr> <tr> <td><math>BR_1, BR_2</math></td> <td>= Residue for duplicate blanks (g)</td> </tr> <tr> <td><math>f_{BF}</math></td> <td>= Final Blank Filter Bag (g)</td> </tr> <tr> <td><math>f_{BS}</math></td> <td>= Initial Blank Filter Bag (g)</td> </tr> <tr> <td><math>P_B</math></td> <td>= Protein of Blank Filter Bag (g)</td> </tr> <tr> <td><math>A_B</math></td> <td>= Ash of Blank Filter Bag (g)</td> </tr> <tr> <td><math>D_B</math></td> <td>= Original wt of Diatomaceous Earth in Blank Filter Bag (g)</td> </tr> <tr> <td><b>WASDF</b></td> <td>= Soluble Dietary Fiber determined by HPLC</td> </tr> </table>	$M_1, M_2$	= Original wt of duplicate samples adjusted for pre-treatment fat losses (g)	$R_1, R_2$	= Residue for duplicate samples (g)	$f_F$	= Final Filter Bag with residue (g)	$f_S$	= Initial Filter Bag (g)	$D$	= Original wt of Diatomaceous Earth (g)	$P$	= Protein of residue and bag (g)	$A$	= Ash of residue and bag (g)	$B$	= Blank (g)		= $[(BR_1 + BR_2)/2] - P_B - (A_B - D_B)$		= $[(f_{BF1} - f_{BS1} - D_{B1}) + (f_{BF2} - f_{BS2} - D_{B2})]/2 - P_{B1} - (A_{B2} - D_{B2})$	$BR_1, BR_2$	= Residue for duplicate blanks (g)	$f_{BF}$	= Final Blank Filter Bag (g)	$f_{BS}$	= Initial Blank Filter Bag (g)	$P_B$	= Protein of Blank Filter Bag (g)	$A_B$	= Ash of Blank Filter Bag (g)	$D_B$	= Original wt of Diatomaceous Earth in Blank Filter Bag (g)	<b>WASDF</b>	= Soluble Dietary Fiber determined by HPLC
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<b>WASDF</b>	= Soluble Dietary Fiber determined by HPLC																																		

**34. Crystallization of TRIZMA Base in the silicone tubing can happen overnight and will cause a fault during a run the next day. To prevent this, it is necessary to flush this line out at the end of each day that the instrument has been used. Please see Appendix C for the Trizma Line Flush procedure.**

## Status Screen

The only Status Screen difference between the AOAC 991.43/985.29/2001.03 methods and the AOAC 2017.16/2022.01 methods is the pH information located in the upper left corner of the screen.



See the ANKOM<sup>TDF</sup> Dietary Fiber Analyzer Operator's Manual for more information about the Status Screen.

## Fault Handling

There are no Fault Handling differences between the AOAC 991.43/985.29/2001.03 methods and the AOAC 2017.16/2022.01 methods.

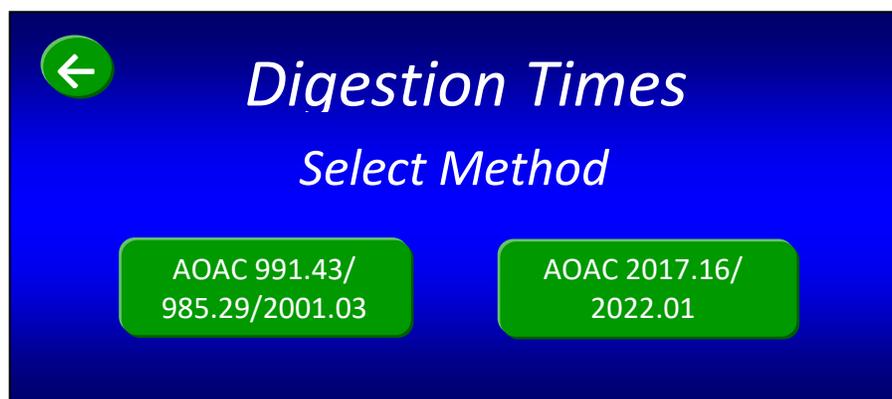
See the ANKOM<sup>TDF</sup> Dietary Fiber Analyzer Operator's Manual for information about Fault Handling.

## Diagnostics Mode

The only Diagnostics Mode differences between the AOAC 991.43/985.29/2001.03 methods and the AOAC 2017.16/2022.01 methods are shown below.

### Digestion Times

When you press the Digestion Times button on the Diagnostics screen, you will be asked to select between the two methods as shown below.



When you press the “AOAC 2017.16/2022.01” button the following screen will be displayed.

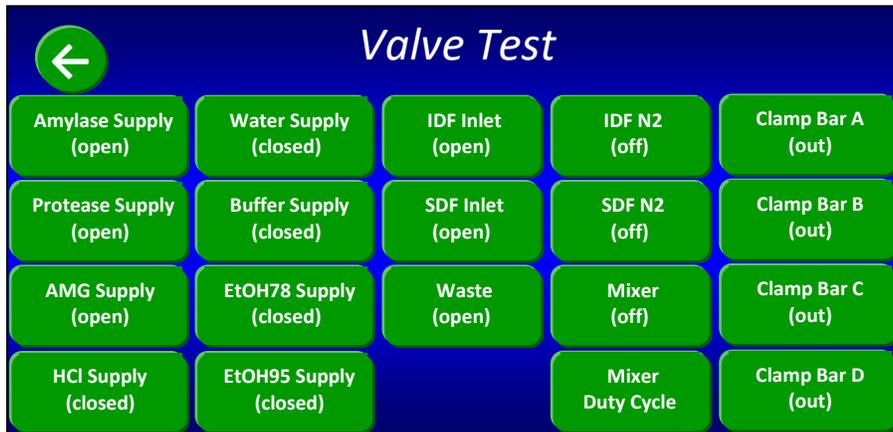


This diagnostic allows you to modify the times used by the computer for the digestion processes. This can be helpful when troubleshooting or demonstrating the instrument. If you press the “Save to Permanent Memory” button, the values you entered will be saved until you change them again by using this diagnostic. If you do not press the “Save to Permanent Memory” button, the values you entered will be saved until power is turned off, or until you change them again by using this diagnostic.

**IMPORTANT:** If you start a new procedure with Digestion Times other than the official method times, a message will be displayed on the Touch Screen Display that allows you to reset the values. A Reset from this Warning Screen is only temporary. Use the Digestion Times screen in Diagnostics to make the reset permanent.

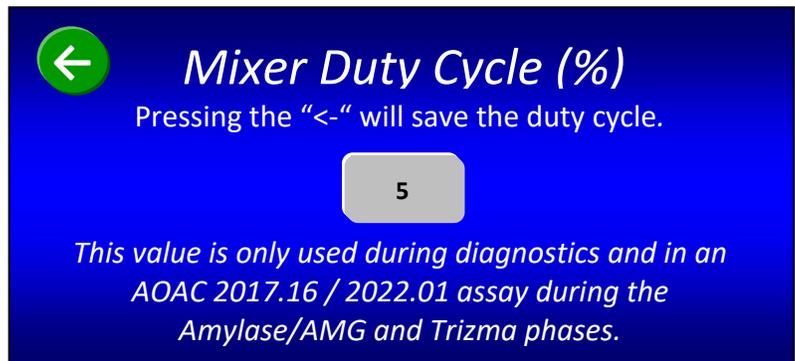
### Mixer Duty Cycle

When you press the “Valve Test” button on the “Diagnostics” screen, the following screen will be displayed.



When you press the “Mixer Duty Cycle” button on the “Valve Test” screen, the following screen will be displayed.

The number that you enter into the gray box on the screen will be used during the Amylase/AMG digestion and Trizma phases. The default mixer duty cycle is 5%. See the ANKOM<sup>TDF</sup> Dietary Fiber Analyzer Operator’s Manual for more information about Diagnostics Mode.



## Appendix A – Reagents (AOAC 2017.16/2022.01)

Use Deionized (DI) or Distilled (DW) Water throughout.

### Best practices for solution preparation

The best practice for preparation of solutions is to make them fresh and use them within two days. This is especially true of the MES-TRIS buffer and Phosphate buffer solutions which can readily support microbial growth. Failure to maintain necessary cleanliness and prevent contamination can dramatically affect shelf life of solutions.

### Reagents

- (a) *Ethanol 95%*.
- (b) *Ethanol 78%*—Place 821 ml 95% ethanol into 1 L volumetric flask and dilute to volume with water.
- (c) *Acetone*—reagent grade.
- (d) *Sodium maleate buffer solution*—50 mM, pH 6.0 and 2 mM CaCl<sub>2</sub>. Dissolve 11.6 g of maleic acid in 1600 ml of water and adjust the pH to 6.0 with 4 M (160 g/L) NaOH solution. Add 0.6 g of calcium chloride (CaCl<sub>2</sub>·2H<sub>2</sub>O) and adjust the volume to 2 L.



**Hazardous Materials** – Only handle maleic acid after reviewing MSDS.

**Do not add sodium azide to the buffer solution when using the TDF instrument.**

Although the methods call for sodium azide in the buffer as a preservative, it is not required for the method. The buffer solution should be made fresh each day. Strong reaction may occur if sodium azide is added to the buffer and used in the TDF instrument.

- (e) *Enzyme Solutions*

The AOAC and AACC methods require the following enzyme activity per sample:

- Pancreatic  $\alpha$ -Amylase: 4,000 Units
- Amyloglucosidase (AMG): 1,700 Units
- Protease: 30 Tyrosine Units

Prepare enzyme solutions for use in the ANKOM<sup>TDF</sup> Dietary Fiber Analyzer as follows:

ANKOM <sup>TDF</sup> Enzyme Solutions	Enzyme	*Enzyme Concentration
<u><math>\alpha</math>-Amylase (Pancreatic)/AMG solution</u>		
1. Measure 2.5 g $\alpha$ -Amylase (Pancreatic)/AMG (SKU 8500) into a 50ml volumetric flask		
2. Make up to mark with sodium maleate buffer		
	$\alpha$ -Amylase (Pancreatic)	2000 Ceralpha U/ml
	Amyloglucosidase	850 Glucose U/ml
<u>Protease solution</u>		
1. Dilute 2.15 ml Protease (SKU 8500) to 25ml with sodium maleate buffer		
		30 Tyrosine U/ml
*The ANKOM <sup>TDF</sup> Dietary Fiber Analyzer delivers 2ml of the amylase/AMG solution and 1ml of the protease solution to each of the six stations per run. If you are not using the ANKOM enzyme concentrates, you must prepare enzyme solutions to the recommended concentration, and it must include 0.02% w/v of Sodium Azide (to prevent microbial growth).		

- (f) *Diatomaceous earth (DE)*—(ANKOM DE1, DE2 or equivalent).
- (g) *Trizma Base, 0.75 M*—Add 90.8 g of Trizma (Sigma cat. No. T-1503) to ca 800 ml of water and dissolve. Adjust volume to 1 L.
- (h) *Acetic acid solution, 2 M*—Add 115 ml of glacial acetic acid (Fluka 45731) to a 1 L volumetric flask. Dilute to 1 L with water.
- (i) *D-Sorbitol (Internal standard solution)*—100 mg/ml. Weigh 100 g of dry D-Sorbitol into a beaker, dissolve in water and transfer to a 1 L volumetric flask with water and dilute to volume. Transfer to a polypropylene bottle and add 0.2 g of sodium azide as a preservative.

## Appendix B - Analytical Procedures

**IMPORTANT:** While infrequent, procedures may be updated with new information. For the most up-to-date procedure revision refer to: <https://www.ankom.com/analytical-methods-support/tdf-analyzer>.

### TDF Method (AOAC 2017.16, AACC 32-60.01) using the ANKOM<sup>TDF</sup> Dietary Fiber Analyzer

**Definition-** Using Filter Bag Technology, this method determines the amount of TDF within a given sample using the weight of the recovered TDF residue corrected for ash and protein content.

**Scope-** Total, Soluble, and Insoluble Dietary Fiber in Foods and Feeds

#### Apparatus

- Analytical Balance—capable of weighing 0.1 mg.
- Oven—capable of maintaining a temperature of  $105 \pm 2^\circ\text{C}$ .
- Fiber Recovery instrument capable of separately recovering IDF, SDF, and TDF residue. The instrument must be capable of automatically adding all reagents, mixing the sample to ensure proper digestion, and controlling digestion and precipitation temperatures (ANKOM<sup>TDF</sup> Dietary Fiber Analyzer, ANKOM Technology).
- Filter Bags (DF-S, DF-FT, ANKOM Technology).
- Bag Weigh Holder—used for eliminating static during bag weighing process (TDF52, ANKOM Technology).
- Drying Rack—used for drying filter bags (TDF50, ANKOM Technology).
- Heat sealer—sufficient for sealing the filter bags closed to ensure complete closure (HS, ANKOM Technology).
- Desiccant Pouch—collapsible sealable pouch with desiccant inside that enables the removal of air from around the filter bags (X45, Moisture Stop weigh pouch, ANKOM Technology).
- Marking pen—solvent and acid resistant (F06, ANKOM Technology).
- Acetone rinse stand (TDF51 Rinse Stand, ANKOM Technology).

#### Reagents

Use Deionized water (DI) or Distilled (DW) throughout.

- Ethanol 95%.
- Ethanol 78%—Place 821 ml 95% ethanol into 1 L volumetric flask and dilute to volume with H<sub>2</sub>O.
- Acetone—reagent grade.
- Sodium maleate buffer solution—50 mM, pH 6.0 and 2 mM CaCl<sub>2</sub>. Dissolve 11.6 g of maleic acid in 1600 ml of water and adjust the pH to 6.0 with 4 M (160 g/L) NaOH solution. Add 0.6 g of calcium chloride (CaCl<sub>2</sub>·2H<sub>2</sub>O) and adjust the volume to 2 L.

**IMPORTANT: Do not add sodium azide to the buffer solution when using the TDF instrument.** Although the methods call for sodium azide in the buffer as a preservative, it is not required for the method. The buffer solution should be made fresh each day. Strong reaction may occur if sodium azide is added to the buffer and used in the TDF instrument.

(e) *Enzyme solutions*— The AOAC and AACC methods require the following enzyme activity per sample:

- Pancreatic  $\alpha$ -Amylase: 4,000 Units
- Amyloglucosidase (AMG): 1700 Units
- Protease: 30 Tyrosine Units

Prepare enzyme solutions for use in the ANKOM<sup>TDF</sup> Dietary Fiber Analyzer as follows:

ANKOM <sup>TDF</sup> Enzyme Solutions	Enzyme	*Enzyme Concentration
<b><u><math>\alpha</math>-Amylase (Pancreatic)/AMG solution</u></b> 1. Measure 2.5 g $\alpha$ -Amylase (Pancreatic)/AMG (SKU 8500) into a 50ml volumetric flask 2. Make up to mark with sodium maleate buffer	$\alpha$ -Amylase (Pancreatic)	2000 Ceralpha U/ml
	Amyloglucosidase	850 Glycose U/ml
<b><u>Protease solution</u></b> 1. Dilute 2.15 ml Protease (SKU 8500) to 25ml with sodium maleate buffer		30 Tyrosine U/ml
*The ANKOM <sup>TDF</sup> Dietary Fiber Analyzer delivers 2ml of the amylase/AMG solution and 1ml of the protease solution to each of the six stations per run. If you are not using the ANKOM enzyme concentrates, you must prepare enzyme solutions to the recommended concentration, and it must include 0.02% w/v of Sodium Azide (to prevent microbial growth).		

- Diatomaceous earth (DE)*—(ANKOM DE1/DE2, Celite 545 AW, No. C8656, Sigma Chemical Co. or equivalent).
- Trizma Base, 0.75 M*—Add 90.8 g of Trizma (Sigma cat. No. T-1503) to ca 800 ml of DI or DW water and dissolve. Adjust volume to 1 L.
- Acetic acid solution, 2 M*—Add 115 ml of glacial acetic acid (Fluka 45731) to a 1 L volumetric flask. Dilute to 1 L with DI or DW water.
- D-Sorbitol (Internal standard solution)*—100 mg/ml. Weigh 100 g of dry D-Sorbitol into a weigh boat. Fill a beaker with 800 ml of DI or DW water and add the D-Sorbitol to it. Once dissolved, transfer to a 1 L volumetric flask and dilute to volume with DI or DW water. Transfer to a polypropylene bottle and add 0.2 g of Sodium Azide as a preservative. (NOTE: Handle sodium azide with caution only after reviewing MSDS.)

#### Sample Preparation

- Grind samples in a centrifugal mill with a 0.5 mm screen. Samples ground finer may have particle loss from the filter bags and result in low values.
- De-fat and de-sugar samples as needed based on the AOAC

**Calculations (all weights in grams)**

$$\begin{aligned} \% \text{ TDF} &= \% \text{ WSWAIDF} + \% \text{ WASDF} \\ &= \left( \frac{\left[ \frac{[(R_1+R_2)/2]-P-A-B}{(M_1+M_2)/2} \right] \times 100}{\left[ \frac{[(f_{F1}-f_{S1}-D_1)+(f_{F2}-f_{S2}-D_2)]/2-P-(A_2-D_2)-B}{(M_1+M_2)/2} \right] \times 100} \right) + \% \text{ WASDF} \end{aligned}$$

Where:

- M<sub>1</sub>,M<sub>2</sub> = Original wt for duplicate samples adjusted for pre-treatment fat and sugar losses (g)
- R<sub>1</sub>,R<sub>2</sub> = Residue for duplicate samples (g)
- f<sub>F</sub> = Final Filter Bag (g)
- f<sub>S</sub> = Initial Filter Bag (g)
- D = Original wt of Diatomaceous Earth (g)
- P = Protein of residue and bag (g)
- A = Ash of residue and bag (g)
- B = Blank (g)
- BR<sub>1</sub>,BR<sub>2</sub> = Residue for duplicate blanks (g)
- f<sub>BF</sub> = Final Blank Filter Bag (g)
- f<sub>BS</sub> = Initial Blank Filter Bag (g)
- P<sub>B</sub> = Protein of Blank Filter Bag (g)
- A<sub>B</sub> = Ash of Blank Filter Bag (g)
- D<sub>B</sub> = Original wt of Diatomaceous Earth in Blank Filter Bag (g)
- WASDF = Soluble Dietary Fiber determined by HPLC

2017.16 method and adjust sample weights accordingly.

**TDF Procedure** (see the TDF Analysis section of the Automated AOAC 2017.16/2022.01 and AACC 32-60.01 Method Operator's Manual for more detail)

1. Label the filter bags using a solvent resistant marker.
2. Fill chemical containers to the Min. Level line or above.
3. Fill the Protease enzyme container to the 15 ml line or above. Fill the Amylase/AMG mixture and Trizma Base containers to the 25 ml line or above.
4. Place each filter bag in a tared Bag Weigh Holder and record the weight.
5. Place ca 1 g of DE in each of six tared and numbered tins and record the weights.
6. Place 0.5±0.05 g of sample in each of six tared and numbered tins and record the weights.
7. Remove all Clamp Bars from the instrument.
8. Follow the instructions on the Touch Screen Display (as detailed in steps 9-28 below).
9. Install SDF bags by gently pulling the black SDF Delivery Nozzle toward you and pulling each bag up so that the nozzle is inside the bag. Pull the bag up so that the top of the bag is about 35 mm (1.375 inches) above the top of Clamp Bar C and return the nozzle to its original position to hold the bag in place. Center each bag within the black lines located on the back of Clamp Bar C.
10. Re-install Clamp Bar D.
11. Flatten the bags to remove any wrinkles.
12. Press the check mark button (☑) on the "SDF Bags (and clamp bar D) installed?" screen on the Touch Screen Display. This will close bar D which will pinch the bags just above the filter.
13. Add DE to each SDF bag, rinsing the tin with no more than 3 ml of 78% to ensure complete transfer and that all the DE is below the SDF Delivery Nozzle.
14. Install IDF *Flow-Thru* bags by pulling the black IDF Delivery Nozzle toward you and pulling each bag up underneath the nozzle. Pull the bag up so that the top of the filter part of the IDF bag is just below the bottom of Clamp Bar B and return the nozzle to its original position to hold the bag in place. Center each bag within the black lines located on the back of Clamp Bar A.
15. Place at least 20 mm (0.75 inches) of the bottom of each IDF *Flow - Thru* bag inside the top of each corresponding SDF bag.
16. Re-install Clamp Bar B.
17. Flatten the bags to remove any wrinkles.
18. Press the check mark button (☑) on the "IDF Bags (and clamp bar B) installed?" screen on the Touch Screen Display. This will close bar B which will pinch the bags just above the filter.
19. Re-install Clamp Bar C.
20. Add sample into each of the IDF bags. Rinse the tin with no more than 3 ml of DI or DW water to ensure complete transfer and that all the sample is below the IDF Delivery Nozzle.
21. Secure the front of each SDF filter bag in place with the hook located on the front part of Clamp Bar C.

**TDF Procedure (continued)**

22. Check that the Nitrogen supply is connected to the instrument and turned on.
23. Set Filter Times.

24. Set the manual pH checks.
25. Add 1 ml of Internal Standard or instruct the instrument to prompt for a later addition.
26. Press the START button to begin the automated processes.
27. Check the pH after the Trizma Base has been added. (If configured, the instrument will stop so you can make this check.) Adjust to 7.9-8.4 as needed.
28. Check the pH after the Acetic Acid has been added. (If configured, the instrument will stop so you can make this check.) Adjust to approximately 4.3 as needed.
29. After the automated processes are complete, rinse the SDF bags twice with acetone. ANKOM recommends the use of the ANKOM TDF51 Rinse Stand for the acetone rinses.
30. After the acetone has evaporated, with your Heat Sealer set between 3 and 4 (settings may vary depending on the heat sealer and the power source), press the Heat Sealer arm down for 3 to 4 seconds to seal each bag just above the filter. This keeps all residue contained to the filter area while handling the bags.
31. Place each bag in the Drying Rack and place the rack in an oven set to 105°C. Dry to constant weight (about 90 min).
32. Remove all of the bags from the oven and place them in desiccant pouches to cool.
33. Removing only one filter bag from the desiccant pouches at a time, place each filter bag in a tared Bag Weigh Holder and record the weights.
34. Determine the protein content within the SDF residue. See the “Protein Determination Procedure – SDF / TDF” in the Operator’s Manual for more information.
35. Determine the ash content within the SDF residue. See the “Ash Determination Procedure – IDF / SDF / TDF” in the Operator’s Manual for more information.
36. Using an HPLC, determine the WASDF from the filtrate in the instrument Filtrate Cups.
37. Calculate % TDF values.

**IDF/SDF Method (AOAC 2022.01) using the ANKOM<sup>TDF</sup> Dietary Fiber Analyzer**

**Definition-** Using Filter Bag Technology, this method determines the amount of IDF, SDF, and TDF within a given sample using the weight of the recovered IDF and SDF residue corrected for ash and protein content.

**Scope-** Total, Soluble, and Insoluble Dietary Fiber in Foods and Feeds

**Apparatus**

1. Analytical Balance—capable of weighing 0.1 mg.
2. Oven—capable of maintaining a temperature of 105 ± 2°C.
3. Fiber Recovery instrument capable of separately recovering IDF, SDF, and TDF residue. The instrument must be capable of automatically adding all reagents, mixing the sample to ensure proper digestion, and controlling digestion and precipitation temperatures (ANKOM<sup>TDF</sup> Dietary Fiber Analyzer, ANKOM Technology).
4. Filter Bags (DF-1, DF-S, ANKOM Technology).
5. Bag Weigh Holder—used for eliminating static during bag weighing process (TDF52, ANKOM Technology).
6. Drying Rack—used for drying filter bags (TDF50, ANKOM Technology).
7. Heat sealer—sufficient for sealing the filter bags closed to ensure complete closure (HS, ANKOM Technology).
8. Desiccant Pouch—collapsible sealable pouch with desiccant inside that enables the removal of air from around the filter bags (X45 Moisture stop weigh pouch, ANKOM Technology).
9. Marking pen—solvent and acid resistant (F06, ANKOM Technology).
10. Acetone rinse stand (TDF51 Rinse Stand, ANKOM Technology).

**Reagents**

Use Deionized (DI) or Distilled (DW) water throughout.

- (a) Ethanol 95%.
- (b) Ethanol 78%—Place 821 ml 95% ethanol into 1 L volumetric flask and dilute to volume with H<sub>2</sub>O.
- (c) Acetone—reagent grade.
- (d) Sodium maleate buffer solution—50 mM, pH 6.0 and 2 mM CaCl<sub>2</sub>. Dissolve 11.6 g of maleic acid in 1600 ml of water and adjust the pH to 6.0 with 4 M (160 g/L) NaOH solution. Add 0.6 g of calcium chloride (CaCl<sub>2</sub>·2H<sub>2</sub>O) and adjust the volume to 2 L.  
**IMPORTANT: Do not add sodium azide to the buffer solution when using the TDF instrument.** Although the methods call for sodium azide in the buffer as a preservative, it is not required for the method. The buffer solution should be made fresh each day. Strong reaction may occur if sodium azide is added to the buffer and used in the TDF instrument.
- (e) Enzyme solutions— The AOAC and AACC methods require the following enzyme activity per sample:
  - Pancreatic α-Amylase: 4,000 Units
  - Amyloglucosidase (AMG): 1,700 Units
  - Protease: 35 Tyrosine Units

Prepare enzyme solutions for use in the ANKOM<sup>TDF</sup> Dietary Fiber Analyzer as follows:

ANKOM <sup>TDF</sup> Enzyme Solutions	Enzyme	*Enzyme Concentration
<b>α-Amylase (Pancreatic)/AMG solution</b>		
2. Measure 2.5 g α-Amylase (Pancreatic)/AMG (SKU 8500) into a 50ml volumetric flask		
3. Make up to mark with sodium maleate buffer		
	α-Amylase (Pancreatic)	2000 Ceralpha U/ml
	Amyloglucosidase	850 Glycose U/ml
<b>Protease solution</b>		
2. Dilute 2.15 ml Protease (SKU 8500) to 25ml with sodium maleate buffer		30 Tyrosine U/ml
*The ANKOM <sup>TDF</sup> Dietary Fiber Analyzer delivers 2ml of the amylase/AMG solution and 1ml of the protease solution to each of the six stations per run. If you are not using the ANKOM enzyme concentrates, you must prepare enzyme solutions to the recommended concentration, and it must include 0.02% w/v of Sodium Azide (to prevent microbial growth).		

- (f) Diatomaceous earth (DE)—(ANKOM DE1/DE2, Celite 545 AW, No. C8656, Sigma Chemical Co. or equivalent).
- (g) Trizma Base, 0.75 M—Add 90.8 g of Trizma (Sigma cat. No. T-1503) to ca 800 ml of DI or DW water and dissolve. Adjust volume to 1 L.
- (h) Acetic acid solution, 2 M—Add 115 ml of glacial acetic acid (Fluka 45731) to a 1 L volumetric flask. Dilute to 1 L with DI or DW water.
- (i) D-Sorbitol (Internal standard solution)—100 mg/ml. Weigh 100 g of dry D-Sorbitol into a beaker, dissolve in DI or DW water and transfer to a 1 L volumetric flask with DI or DW water and dilute to volume. Transfer to a polypropylene bottle and add 0.2 g of Sodium Azide as a preservative. (NOTE: Handle sodium azide with caution only after reviewing MSDS.)

**Sample Preparation**

1. Grind samples in a centrifugal mill with a 0.5 mm screen. Samples ground finer may have particle loss from the filter bags and result in low values.
2. De-fat and de-sugar samples as needed based on the AOAC 2017.16 method and adjust sample weights accordingly.

**IDF/SDF Procedure** (see the IDF/SDF Analysis section of the Automated AOAC 2017.16/2022.01 and AACC 32-60.01 Method Operator's Manual for more detail)

1. Label the filter bags using a solvent resistant marker.
2. Fill chemical containers to the Min. Level line or above.
3. Fill the Protease enzyme container to the 15 ml line or above. Fill the Amylase/AMG mixture and Trizma Base containers to the 25 ml line or above.
4. Place each filter bag in a tared Bag Weigh Holder and record the weight.

**Calculations (all weights in grams)**

$$\begin{aligned} \% \text{ IDF} &= \left[ \frac{[(R_1 + R_2)/2] - P - A - B}{(M_1 + M_2)/2} \right] \times 100 \\ &= \left[ \frac{[(f_{F1} - f_{S1}) + (f_{F2} - f_{S2})]/2 - P - A - B}{(M_1 + M_2)/2} \right] \times 100 \end{aligned}$$

Where:

- M<sub>1</sub>, M<sub>2</sub> = Original wt for duplicate samples adjusted for pre-treatment fat and sugar losses (g)
- R<sub>1</sub>, R<sub>2</sub> = Residue for duplicate samples (g)
- f<sub>F</sub> = Final Filter Bag (g)
- f<sub>S</sub> = Initial Filter Bag (g)
- P = Protein of residue and bag (g)
- A = Ash of residue and bag (g)
- B = Blank (g)
- = [(BR<sub>1</sub> + BR<sub>2</sub>)/2] - P<sub>B</sub> - A<sub>B</sub>
- = [(f<sub>BF1</sub> - f<sub>BS1</sub>) + (f<sub>BF2</sub> - f<sub>BS2</sub>)]/2 - P<sub>B</sub> - A<sub>B</sub>
- BR<sub>1</sub>, BR<sub>2</sub> = Residue for duplicate blanks (g)
- f<sub>BF</sub> = Final Blank Filter Bag (g)
- f<sub>BS</sub> = Initial Blank Filter Bag (g)
- P<sub>B</sub> = Protein of Blank Filter Bag (g)
- A<sub>B</sub> = Ash of Blank Filter Bag (g)

$$\begin{aligned} \% \text{ SDF} &= \% \text{ WSWAIDF} + \% \text{ WASDF} \\ &= \left( \left[ \frac{[(R_1 + R_2)/2] - P - A - B}{(M_1 + M_2)/2} \right] \times 100 \right) + \% \text{ WASDF} \\ &= \left( \left[ \frac{[(f_{F1} - f_{S1} - D_1) + (f_{F2} - f_{S2} - D_2)]/2 - P - (A_2 - D_2) - B}{(M_1 + M_2)/2} \right] \times 100 \right) + \% \text{ WASDF} \end{aligned}$$

Where:

- M<sub>1</sub>, M<sub>2</sub> = Original wt for duplicate samples adjusted for pre-treatment fat and sugar losses (g)
- R<sub>1</sub>, R<sub>2</sub> = Residue for duplicate samples (g)
- f<sub>F</sub> = Final Filter Bag (g)
- f<sub>S</sub> = Initial Filter Bag (g)
- D = Original wt of Diatomaceous Earth (g)
- P = Protein of residue and bag (g)
- A = Ash of residue and bag (g)
- B = Blank (g)
- = [(BR<sub>1</sub> + BR<sub>2</sub>)/2] - P<sub>B</sub> - (A<sub>B</sub> - D<sub>B</sub>)
- = [(f<sub>BF1</sub> - f<sub>BS1</sub> - D<sub>B1</sub>) + (f<sub>BF2</sub> - f<sub>BS2</sub> - D<sub>B2</sub>)]/2 - P<sub>B1</sub> - (A<sub>B2</sub> - D<sub>B2</sub>)
- BR<sub>1</sub>, BR<sub>2</sub> = Residue for duplicate blanks (g)
- f<sub>BF</sub> = Final Blank Filter Bag (g)
- f<sub>BS</sub> = Initial Blank Filter Bag (g)
- P<sub>B</sub> = Protein of Blank Filter Bag (g)
- A<sub>B</sub> = Ash of Blank Filter Bag (g)
- D<sub>B</sub> = Original wt of Diatomaceous Earth in Blank Filter Bag (g)
- WASDF = Soluble Dietary Fiber determined by HPLC

$$\% \text{ TDF} = \% \text{ IDF} + \% \text{ SDF}$$

**IDF/SDF Procedure (continued)**

5. Place ca 1 g of DE in each of six tared and numbered tins and record the weights.
6. Place 0.5±0.05 g of sample in each of six tared and numbered tins and record the weights.
7. Remove all Clamp Bars from the instrument.
8. Follow the instructions on the Touch Screen Display (as detailed in steps 9-28 below).
9. Install SDF bags by gently pulling the black SDF Delivery Nozzle toward you and pulling each bag up so that the nozzle is inside the bag. Pull the bag up so that the top of the bag is about 35 mm (1.375 inches) above the top of Clamp Bar C and return the nozzle to its original position to hold the bag in place. Center each bag within the black lines located on the back of Clamp Bar C.
10. Re-install Clamp Bar D.
11. Flatten the bags to remove any wrinkles.
12. Press the check mark button (☑) on the “SDF Bags (and clamp bar D) installed?” screen on the Touch Screen Display. This will close bar D which will pinch the bags just above the filter.
13. Add DE to each SDF bag, rinsing the tin with no more than 3 ml of 78% to ensure complete transfer and that all the DE is below the SDF Delivery Nozzle.
14. Install IDF bags by gently pulling the black IDF Delivery Nozzle toward you and pulling each bag up underneath the nozzle. Pull the bag up so that the top of the filter part of the IDF bag is just below the bottom of Clamp Bar B and return the nozzle to its original position to hold the bag in place. Center each bag within the black lines located on the back of Clamp Bar A.
15. Place at least 20 mm (0.75 inches) of each IDF bag filter inside the top of each corresponding SDF bag.
16. Re-install Clamp Bar B.
17. Flatten the bags to remove any wrinkles.
18. Press the check mark button (☑) on the “IDF Bags (and clamp bar B) installed?” screen on the Touch Screen Display. This will close bar B which will pinch the bags just above the filter.
19. Re-install Clamp Bar C.
20. Add sample into each of the IDF bags. Rinse the tin with no more than 3 ml of DI or DW water to ensure complete transfer and that all the sample is below the IDF Delivery Nozzle.
21. Secure the front of each SDF filter bag in place with the hook located on the front part of Clamp Bar C.
22. Check that the Nitrogen supply is connected to the instrument and turned on.
23. Set Filter Times.
24. Set the manual pH checks.
25. Add 1 ml of Internal Standard or instruct the instrument to prompt for a later addition.
26. Press the START button to begin the automated processes.
27. Check the pH after the Trizma Base has been added. (If configured, the instrument will stop so you can make this check.) Adjust to 7.9-8.4 as needed.
28. Check the pH after the Acetic Acid has been added. (If configured, the instrument will stop so you can make this check.) Adjust to approximately 4.3 as needed.

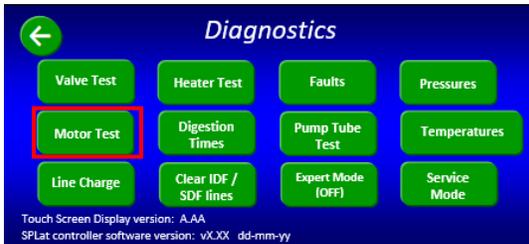
**IDF/SDF Procedure (continued)**

29. After the automated processes are complete, rinse the IDF and SDF bags twice with acetone. ANKOM recommends the use of the ANKOM TDF51 Rinse Stand for the acetone rinses.
30. After the acetone has evaporated, with your Heat Sealer set between 3 and 4 (settings may vary depending on the heat sealer and the power source), press the Heat Sealer arm down for 3 to 4 seconds to seal each bag just above the filter. This keeps all residue contained to the filter area while handling the bags.
31. Place each bag in the Drying Rack and place the rack in an oven set to 105°C. Dry to constant weight (about 90 min).
32. Remove all of the bags from the oven and place them in desiccant pouches to cool.
33. Removing only one filter bag from the desiccant pouches at a time, place each filter bag in a tared Bag Weigh Holder and record the weights.
34. Determine the protein content within the IDF residue. See the “Protein Determination Procedure – IDF” in the Operator’s Manual for more information.
35. Determine the protein content within the SDF residue. See the “Protein Determination Procedure – SDF / TDF” in the Operator’s Manual for more information.
36. Determine the ash content within the IDF and SDF residue. See the “Ash Determination Procedure – IDF / SDF / TDF” in the Operator’s Manual for more information.
37. Using an HPLC, determine the WASDF from the filtrate in the instrument Filtrate Cups.
38. Calculate the % IDF and % SDF values.
39. Calculate % TDF by adding the % IDF and % SDF values.

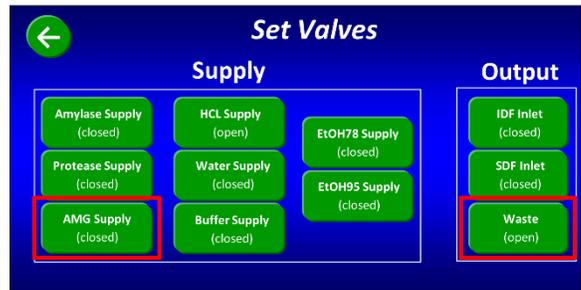
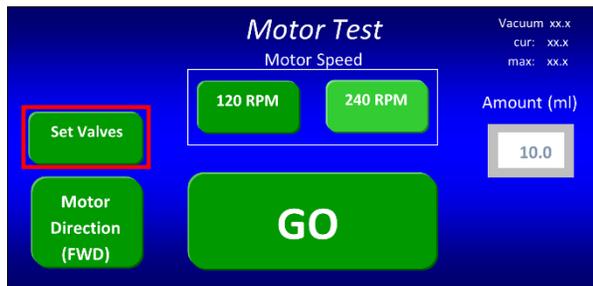
## Appendix C - TRIZMA Line Flush

Crystallization of TRIZMA Base in the silicone tubing can happen overnight and will cause a fault during a run the next day. To prevent this, it is necessary to flush this line out at the end of each day that the instrument has been used.

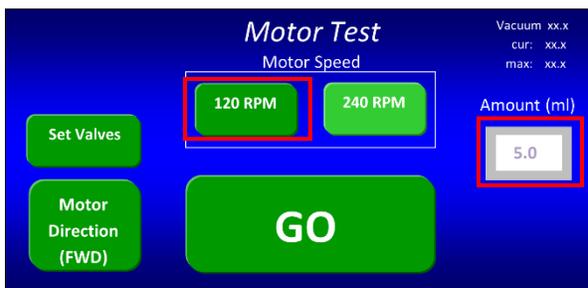
1. Fill an enzyme vial with 30 ml of Deionized (DI) or Distilled (DW) water.
2. Connect it to the TRIZMA (AMG) fitting on the enzyme container bracket.
3. Go to “Diagnostics” and press “Motor Test.”



4. Select “Set Valves”, open the “AMG Supply” Valve and the “Waste” output valve. Close all other valves.



5. Press the back arrow to return to the main “Motor Test” screen.
6. Set the volume to 5ml.
7. Set speed to 120 RPM.



8. Press “GO” (30 ml will empty the vial).

## Appendix D – How to run AOAC 2009.01/2011.25 on an AOAC 2017.16/2022.01 enabled instrument

AOAC 2017.16/2022.01 is the rapid integrated version (4-hour Amylase/AMG digestion) that has superseded the AOAC 2009.01 and 2011.25 methods. While the AOAC 2009.01/2011.25 method names do not appear on screen, the TDF Dietary Fiber Analyzer can still run them. To run the AOAC 2009.01 or 2011.25 method, follow the directions below.

1. Start on the “Select a function” screen
2. Select “Diagnostics”
3. Select “Digestion Times”
4. Select the “AOAC 2017.16/2022.01”
5. Change the “Amylase/AMG Digestion Time (hours)” from 4.00 to 16.00. Press the box containing “4.00”, type in “16.00” on the keypad, and then press “Enter”
6. Select the button “SAVE TO PERMANENT MEMORY” if the user wants this setting to be the default. If selected, this will now be the default time (16-hours) for the AOAC 2017.16/2022.01 method.
7. Use the enzyme concentrations as defined in the ANKOM<sup>TDF</sup> Dietary Fiber Operator’s Manual addendum for AOAC 2009.01 / AOAC 2011.25 methods (<https://www.ankom.com/technical-support/tdf-analyzer>).

When running the AOAC 2009.01 or 2011.25 method a yellow warning screen will appear that reminds the user that the run is set for a 16-hour digestion for the AOAC 2017.16 method. Select “Use current times and continue”.

If the user receives the yellow warning screen when running a method and would like to use the official AOAC 2017.16 method times, select “Reset to official method times and continue”. The run will now use the official method time of 4-hours, but it will not change the setting back permanently.

To permanently reset the AOAC 2017.16 method time to its original 4-hour setting, follow the directions below:

1. Start on the “Select a function” screen
2. Select “Diagnostics”
3. Select “Digestion Times”
4. Select the “AOAC 2017.16/2022.01”
5. Select “Reset to official method times and continue”
6. Select “Save to permanent memory”

The AOAC 2017.16 is now set back to its original 4-hour setting permanently.

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	<p><b>FLEX Analyte Extractor</b></p> <ul style="list-style-type: none"> <li>• Vitamin &amp; Cholesterol Analysis - Automatic saponification, extraction, and evaporation of solvent in one instrument</li> <li>• Eliminates bi-phase extractions</li> <li>• State-of-the-art software allows method adjustment and customization</li> </ul>
	<p><b>DELTA Fiber Analyzer</b></p> <ul style="list-style-type: none"> <li>• Crude Fiber (AOCS Ba 6a-05), ADF, NDF</li> <li>• An internal pump system allows the user to connect to and draw from any chemical source within range of the instrument, eliminating the need to lift heavy cubetainers.</li> <li>• Batch process up to 24 samples at one time</li> </ul>
	<p><b>XT15 Fat Extractor</b></p> <ul style="list-style-type: none"> <li>• Official Method AOCS Am 5-04</li> <li>• Fully automatic</li> <li>• Solvent recovery at 97% or greater</li> <li>• Batch process - up to 15 samples at one time</li> </ul>
	<p><b>RF Gas Production System</b></p> <ul style="list-style-type: none"> <li>• High sensitivity pressure measurement</li> <li>• Applications include: Biomass-to-Energy analysis (e.g., Ethanol, methane, etc.), Biodegradability, Ruminant Nutrition, Yeast Activity, Beer/Wine Fermentation, Soil respiration, BOD, Human Digestion, etc.</li> <li>• Wireless Computer control and data storage</li> </ul>
	<p><b>Chemicals</b></p> <ul style="list-style-type: none"> <li>• A wide variety of chemicals used for many different lab operations</li> <li>• Pre-mixed solutions available</li> </ul>

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