



# Standard Operating Procedure



## TPO/TPAir determination with 410 M

### 1. Introduction

#### • Scope

This procedure shows the correct use of the system piercing device (29972.M) + 410 M + M1100 L for TPO/TPAir determination in soft drinks.

#### • Applicable instruments and sensors

Brand	Systems	Instruments	Sensors	Others
Orbisphere	29772.M	410M	M1100 L	

	Date	Initials
Redaction		CC
Approbation		
Validation		

### 2. Items to collect and reference documents

Piercing device 29972.M	 DOC024.52.93010_2 9971-2_8ed.pdf
410 M	 DOC024.52.93023_K -M1100+410_15ed.p
M1100 L sensor	
Shaker for sample preparation	Model 32816 reciprocating shaker
Balance, which can weigh to the nearest 1 g for overflow volume and net content volume determination	Not provided by Hach
Timer and graduated cylinder (minimum 200 mL) for flow rate verification	Not provided by Hach

### 3. Description

Before starting the measurements, refer to the supplied documentation to install the system,

- Piercer connected to the forcing gas.
- Liquid circuit (tubing) installed.
- Sensor installed in the flow chamber of the piercer and connected to the transmitter.

After the system installation, do the steps that follow to perform analyses.

### • 3.1. Controller configuration

Make sure that the controller is correctly installed and configured.

1. Go to **Main Menu>Measurement>Config. Instrument** and make sure that the controller is configured in **Sample mode**.
2. Go to **Main Menu>Measurement>Configure Channel>Sample Mode** and make sure that **TPO** or **TPAir calculation** is selected in the channel configuration.
3. If TPAir is selected, the K coefficient (O<sub>2</sub>/N<sub>2</sub> ratio in air) value is by default set at 5, but the user can change this value.

The TPO/TPAir calculation is complete only if the measurement stops because a stop criterion is reached. Otherwise, if the user push the **OFF** button or if the stop criterion is not reached before the maximum configured time, the message “ABORTED” shows on the display and the measurement is not recorded. The recommended configuration is:

- Go **Main Menu>Measurement>Configure Channel>Sample Mode>Stop Criteria** and choose **Stability** with the following default values options. Variation: 1.0 ppb; Depth: 5 points; Maximum Time: 600 s; Time filter: not enable.

### • 3.2. Overflow volume/Net content volume

For the TPO/TPAir determination, some properties of the analyzed package are necessary, especially the overflow volume (volume of the package) and the net content volume (volume of liquid in the package).

The recommendation is to collect three samples. For each sample:

- Weigh the package sample (a)
- Empty the package. Weigh the empty package (b)  
*Note: if the package is a bottle, do not forget to weigh the cap with the bottle.*
- Completely fill the package with water and weigh it (c)  
*Note: if the package is a bottle, do not forget to weigh the cap with the bottle.*
- Calculate the volumes as follows:  
Overflow volume = c – b  
Net content volume = (a – b) / density of the sample
- Calculate the average of the three samples and record the value to use it during the next series of TPO/TPAir determination for this package.

Use the template that follows for the volumes calculation. Only fill the blue cells.

<b>Package Name</b>				
Density of sample	1	g/mL	Change value if necessary	
<b>Package</b>	<b>a (g)</b>	<b>b (g)</b>	<b>c (g)</b>	
1				
2				
3				
<b>Overflow Volume</b>		0		
<b>Net Content Volume</b>		0		

### • 3.3. Piercer adjustment

Before starting measurements, adjust the beverage package sampler for the type of beverage sample container (bottle, can, etc). Refer to Figure 7 and do the steps that follow:

1. Push the top (moveable) black block to the highest position (A) to lift the piercing and sampling assembly.
2. Make sure that the piercing lever (B) is in a vertical position.
3. Hold the piercing unit sliding assembly with the hand and loosen the orange securing handle (C).
4. Lift the piercing unit sliding assembly upwards on its two metal columns.
5. Put the beverage sample (e.g., bottle, can) to be analyzed on the mat of the base plate (D).
6. Lower the piercing unit carefully until the piercing head support plate with its circular hole touches the top of the beverage sample (E). The piercing head support prevents unwanted movement of the beverage sample.
7. Lift the orange securing handle with your right hand to the upper position of the groove and
8. retighten it

The unit is now ready for measurement on this type of package.

Note: If the type of package sample is changed, such as a different dimension bottle or can, the user must do the adjust procedure again.

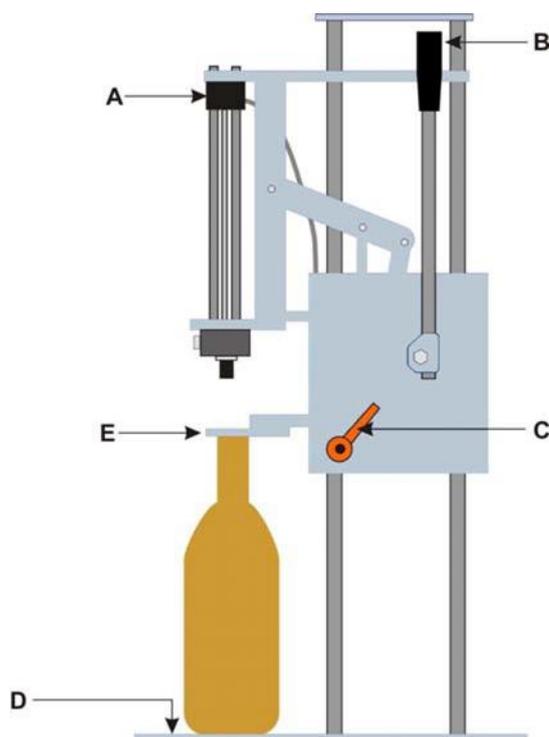


Figure 1: Package adjustment

### • 3.4. Flow rate verification

The recommended flow rate is approximately 150 mL/min for the dissolved oxygen measurement. Verify the flow rate as follow:

1. Put a can or bottle on the piercing device and adjust the body position of the piercing device as described in section 3.3.
2. Make sure that the outlet valve is in the on/off position and put the outlet tube in the graduated cylinder.
3. Pierce the package, move the piercer head down and open the forcing gas inlet.
4. At the same time, start the timer for 1 minute and open the outlet valve slightly so that the sample can flow in the system without bubbles before the flow chamber.
5. After 1 minute, lift the piercer head and examine the volume of liquid in the cylinder. If the volume in the cylinder is between 130 mL and 170 mL, keep the valve on its position. Otherwise, repeat the flow rate verification procedure until got a volume in this range
6. Stop the forcing gas inlet and remove the package from the piercer.

### • 3.5. Dissolved oxygen measurement—TPO/TPAir calculation

1. Shake the can/bottle to analyze for at least 5 minutes to equilibrate the oxygen content between liquid and gas phases.
2. Put the can/bottle on the piercer and adjust the body position for the piercing device as described in section 3.3.
3. Low the lever forwards so that the rubber and the knife of the piercer head are in contact with the package.
4. Pierce the package and move the needle down.
5. Open the forcing gas inlet. Start the measurement on the transmitter.

The measurement stops when the stop criterion is reached, the OFF button is pushed on the controller, or the programmed time to reach the stop criterion expires.

6. When the analysis is finished, close the forcing gas entry and wait a few seconds to let the pressure in the package decrease.
7. Move the needle up and lift the lever to its vertical position.
8. Remove the package.

#### Stop criterion is reached:

A dialogue box appears on the controller display asking the Overflow volume and Net content volume values defined in section 3.2. Enter the volume values and push the **Compute TPO/TPAir** button. The results of TPO/TPAir calculation shows on the right of the box. If necessary, do the calculation again with other volumes. Make sure to push the **OK** button to record the result. If the **Cancel** button is pressed, the result is not saved.

#### Stop criterion is not reached before maximum time has expired or OFF button has been pressed:

In this case, the message **ABORTED** shows on the controller display. It is not possible to access to the TPO/TPAir calculation for this sample. No data is saved.

### • 3.6. System cleaning

After a series of measurements, or before a shutdown, do the steps that follow to clean the system.

1. Fill a can or a bottle previously pierced with warm water.
2. Put the can or bottle on the piercing device and pierce it.
3. Open the forcing gas inlet and move the piercer head down.
4. Let the water flow in the system.
5. When the package is empty, move the piercer head up and close the forcing gas inlet.
6. Remove the package.

Note: the recommendation is to use a dedicated 1 L bottle for the cleaning.