

## Application Note

# Measurement of gas volume and air content in carbonated energy drink by Gas volume and air content analyzer

Industry	Food & beverage
Instrument	Gas volume and air content analyzer
Measurement method	Gas volume measurement method
Standards	

## 1. Scope

### Caution

This instrument needs a 6 mol/L sodium hydroxide aqueous solution which may cause blindness when it contacts human eyes. Be sure to wear protective goggles during handling it.

The measurement of the gas volume, air content of carbonated beverages is an important factor in determining the mouthfeel, taste and flavor, and best-by date. This Application Note introduces an example of measuring commercially available carbonated energy drink of two different products using a gas volume and air content analyzer. The gas volume is calculated by continuously rotating the sample container and measuring the equilibrium pressure of the gas and the sample temperature. Then, gas in the sample is transferred to the absorbent cylinder and the carbon dioxide gas is absorbed by an absorbent solution (sodium hydroxide solution) filled in the cylinder to measure the air content.

## 2. Precautions

- Measurements should be conducted within a temperature-controlled laboratory room, and the temperature of the instrument and samples must be equalized to that of the room.
- Either the instrument's onboard air system, or an independent air compressor, (both of which can adjust to pressures between 0.5 and 0.7 MPaG), is required for the piercing and rotation of sample bottles and cans.

## 3. After measurement

- Samples should be disposed of properly after the measurement is complete, as they may be contaminated with the absorbent solution.
- The measurement instrument should be rinsed properly at the end of the day.
- When measuring samples containing solids such as pulp, clean the net filter of the instrument after measurement for the day is complete.

## 4. Apparatus

Equipment	Gas volume and air content analyzer
-----------	-------------------------------------

## 5. Reagents

Absorbent solution	6 mol/L Sodium hydroxide solution
Rinse solution	Pure water

## 6. Procedure

- 1) Select “gas volume/gas pressure + air content measurement (GV/P+AIR)” on the measurement mode, and enter the following parameters into the measurement conditions.

< Mode >	GV/P+AIR
GV/P Cal.	SOFT
DISSOLVE	AUTO
< Method >	
Start Time	0 sec
Rot0 Time	0 sec
Wait Time	0 sec
Snift Press	.005 MPa
MAX Time	180 sec
MIN Time	10 sec
Error Press	.015 MPa
Rot1 Time	70 sec
Trial Press	.010 MPa
max Time	180 sec
Min Time	10 sec
Trial Count	5 times
Skip Press	.015 MPa
Rot2 Time	20 sec
End Press	.015 MPa

Note that the above measurement parameters are an example and optimizing these parameters might be necessary depending on the sample's property.

- 2) Set the sample bottle/can on the sample stage and press the Start button.

## 7. Example

Table 1 shows the measurement results of carbonated energy drinks (160mL).

Table 1. Measurement results list\*

Sample	n	Air Volume [mL]	Gas Volume [V/V]	Gas Press [MPa]	Press [MPa]	Temp. [°C]
Carbonated energy drink A can	1	0.83	2.91	0.295	0.329	22.0
	2	0.80	2.97	0.301	0.328	21.9
	3	0.71	2.93	0.297	0.317	22.0
	4	0.63	2.95	0.299	0.321	22.0
	5	0.77	2.98	0.302	0.324	21.9
	Mean	0.75	2.95	0.299	0.324	22.0
	SD	0.08	0.03	0.003	0.005	0.05
	RSD(%)	10.6	1.0	1.0	1.5	0.2
Carbonated energy drink B bottle	1	1.01	2.4	0.181	0.238	21.8
	2	1.14	2.4	0.181	0.238	21.8
	3	1.16	2.39	0.180	0.240	21.8
	4	1.10	2.38	0.179	0.238	22.0
	5	1.08	2.41	0.183	0.242	22.2
	Mean	1.10	2.40	0.181	0.239	21.9
	SD	0.06	0.01	0.001	0.002	0.2
	RSD(%)	5.3	0.5	0.8	0.7	0.8

\* Measurement items

Air Volume	The volume of gases other than carbon dioxide in the container (mL)
Gas Volume	Carbon dioxide volume (V/V) of 1mL sample volume
Gas Press	Converted pressure in sample bottle/can at 20 °C (MPa)
Press	Measured pressure (MPa)
Temp.	Measured sample temperature (°C)