Oxygen, Dissolved

DOC316.53.01467

HRDO Method **Method 8166**

0.2 to 10.0 mg/L O_2 (HR) **AccuVac® Ampuls**

Scope and application: For water and wastewater

Test preparation

Before starting

Samples must be analyzed immediately after collection and cannot be preserved for later analysis. Avoid sample manipulation that could expose the sample to contamination from atmospheric oxygen or cause oxygen to be lost from the sample.
Always do tests in sample cells or AccuVac© Ampuls. Do not put the instrument in the sample or pour the sample into the cell holder.
Make sure that the sample cells are clean and there are no scratches where the light passes through them.
Rinse the sample cell and cap with the sample three times before the sample cell is filled.
Make sure that there are no fingerprints or liquid on the external surface of the sample cells or AccuVac© Ampuls. Wipe with a lint-free cloth before measurement.
Cold waters can cause condensation on the sample cell or bubbles in the sample cell during color development. Examine the sample cell for condensation or bubbles. Remove condensation with a lint-free cloth. Invert the sample cell to remove bubbles.
Install the instrument cap over the cell holder before ZERO or READ is pushed.
After the test, immediately empty and rinse the sample cell. Rinse the sample cell and cap three times with deionized water.
Review the Safety Data Sheets (MSDS/SDS) for the chemicals that are used. Use the recommended personal protective equipment.
Dispose of reacted solutions according to local, state and federal regulations. Refer to the Safety Data Sheets for disposal information for unused reagents. Refer to the environmental, health and safety staff for your facility and/or local regulatory agencies for further disposal information.

Items to collect

Description	Quantity
High Range Dissolved Oxygen AccuVac® Ampul	1
Polypropylene beaker, 50-mL	1
Stoppers, for 18-mm tubes and AccuVac Ampuls	1
Sample cell, 25-mm (10 mL)	1

Refer to Consumables and replacement items on page 4 for order information.

Sample collection

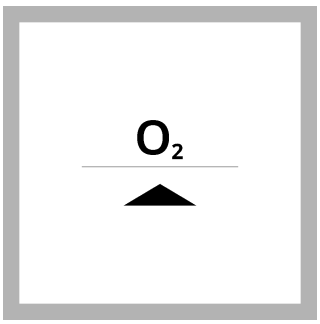
Good sample collection and handling techniques are important to get correct results. The dissolved oxygen content of the sample can change with depth, turbulence, temperature, sludge deposits, light, microbial action, mixing, travel time and other factors. A single dissolved oxygen test rarely reflects the accurate overall condition of a body of water. Several samples taken at different times, locations and depths are recommended for most reliable results.

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The primary consideration with sample collection is to prevent contamination of the sample with atmospheric oxygen.

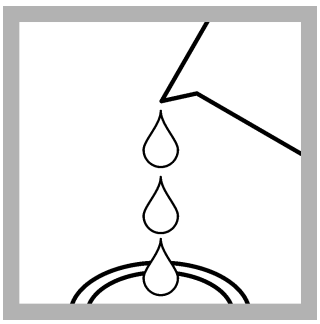
- Samples must be analyzed immediately after collection, although only a small error results if the reading on a capped ampule is taken several hours later. The absorbance will decrease by approximately 3% during the first hour and will not change significantly afterward.
- Make sure to put the cap on the ampule before the ampule is removed from the sample.

AccuVac® Ampul procedure

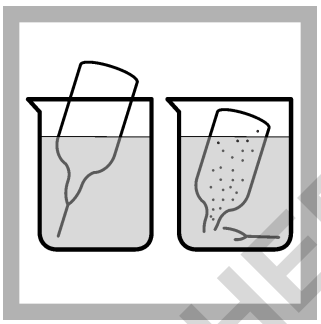


1. Set the instrument to dissolved oxygen (O_2).

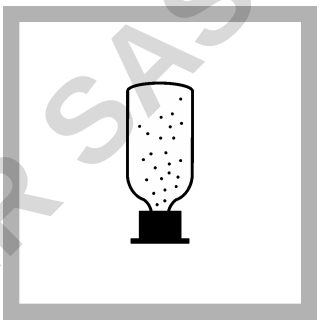
For DR300, push the up arrow button. For PCII, push the menu button, checkmark button, then the menu button again.



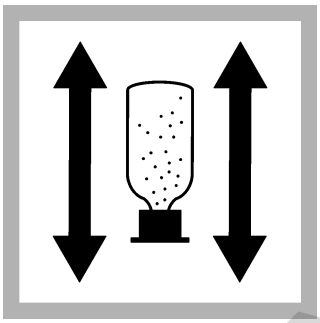
2. Fill a blue stopper with sample.



3. Prepare the sample: Fill the AccuVac Ampul with sample. Keep the tip immersed while the AccuVac Ampul fills completely.



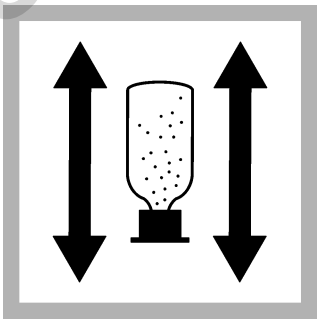
4. Hold the AccuVac Ampul with the tip down. Immediately put the stopper on the tip.
The stopper prevents contamination from atmospheric oxygen.



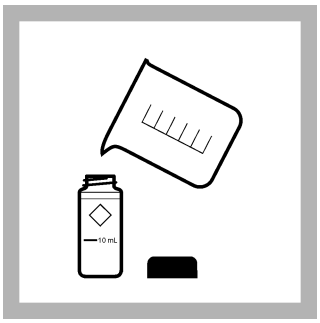
5. Shake the AccuVac Ampul for 30 seconds.
A small quantity of undissolved reagent does not have an effect on the results.



6. Set and start a timer for 2 minutes. A 2-minute reaction time starts.
The oxygen that has degassed during aspiration dissolves again and reacts.

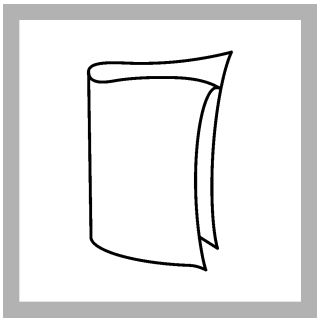


7. When the timer expires, shake the AccuVac Ampul for 30 seconds.
Let all of the bubbles dissipate before the next step.

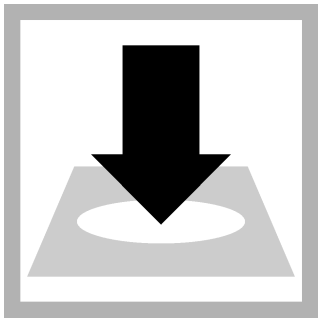


8. Prepare the blank: Rinse a sample cell and cap three times with sample. Fill the sample cell to the 10-mL mark with sample. Close the sample cell.

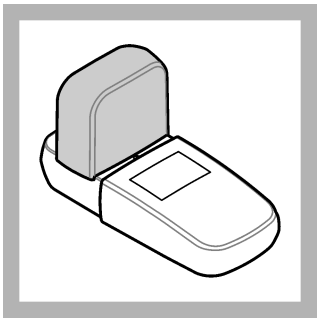
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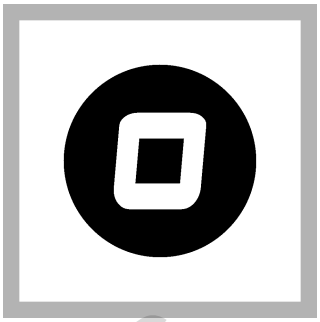
9. Clean the blank sample cell.



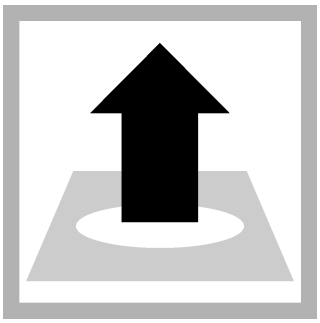
10. Insert the blank into the cell holder. Point the diamond mark on the sample cell toward the keypad.



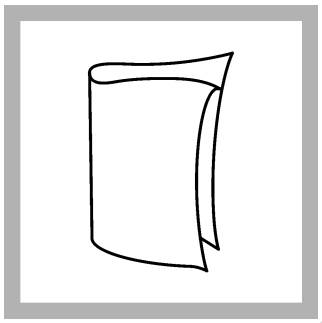
11. Install the instrument cap over the cell holder.



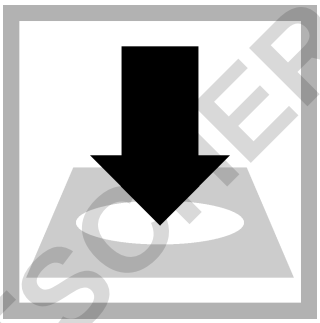
12. Push **ZERO**. The display shows “0.0”.



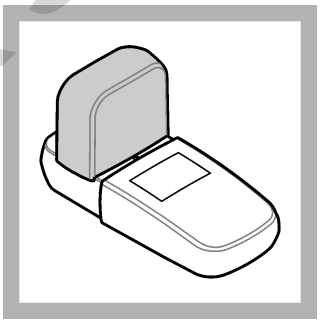
13. Remove the sample cell from the cell holder.



14. Clean the AccuVac Ampul.



15. Insert the prepared sample AccuVac Ampul into the cell holder.



16. Install the instrument cap over the cell holder.



17. Push **READ**. Results show in mg/L dissolved oxygen (O_2).

Interferences

Interfering substance	Interference level
Cr^{3+}	More than 10 mg/L
Cu^{2+}	More than 10 mg/L
Fe^{2+}	More than 10 mg/L
Mg^{2+}	Magnesium in seawater causes a negative interference. If the sample contains more than 50% seawater, the oxygen concentration obtained by this method will be 25% less than the true oxygen concentration. If the sample contains less than 50% seawater, the interference will be less than 5%.
Mn^{2+}	More than 10 mg/L

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Interfering substance	Interference level
Ni^{2+}	More than 10 mg/L
NO_2^-	More than 10 mg/L

Accuracy check

Comparison method

To validate the test results, measure the concentration of the same sample with a dissolved oxygen meter or with a titrimetric method.

Standard solution method

If the Standard Calibration Adjust feature is used to adjust the calibration curve of the DR300 or Pocket Colorimeter II, the concentration of the dissolved oxygen standard must be between 4.0 and 9.0 mg/L dissolved oxygen.

Method performance

The method performance data that follows was derived from laboratory tests that were measured on a DR300 and a Pocket Colorimeter II during ideal test conditions. Users can get different results under different test conditions.

Precision (95% confidence interval)
7.4 ± 0.2 mg/L O_2

Summary of method

The High Range Dissolved Oxygen AccuVac Ampul contains reagent vacuum-sealed in a glass Ampul. When the AccuVac Ampul is opened in a sample that contains dissolved oxygen, the solution forms a yellow color which turns purple. The purple color development is proportional to the concentration of dissolved oxygen.

Consumables and replacement items

Required reagents

Description	Quantity/test	Unit	Item no.
High Range Dissolved Oxygen AccuVac® Ampul	1	25/pkg	2515025

Required apparatus

Description	Quantity/Test	Unit	Item no.
Sample cell, 10-mL round, 25 mm x 60 mm	1	6/pkg	2427606
Beaker, polypropylene, 50 mL, low form	1	each	108041
Stoppers for 18-mm tubes and AccuVac Ampuls	2	6/pkg	173106

Optional reagents and apparatus

Description	Unit	Item no.
AccuVac® Ampul Snapper	each	2405200
AccuVac® Ampul vials for sample blanks	25/pkg	2677925

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11/2018, Edition 2

Ozone

DOC316.53.01468

Indigo Method

Method 8311

0.01 to 0.25 mg/L O_3 (LR), 0.01 to 0.75 mg/L O_3 (MR)

AccuVac® Ampuls

Scope and application: For water.

Test preparation

Before starting

Analyze the samples immediately. The samples cannot be preserved for later analysis.
Always do tests in sample cells or AccuVac© Ampuls. Do not put the instrument in the sample or pour the sample into the cell holder.
Make sure that the sample cells are clean and there are no scratches where the light passes through them.
Rinse the sample cell and cap with the sample three times before the sample cell is filled.
Make sure that there are no fingerprints or liquid on the external surface of the sample cells or AccuVac© Ampuls. Wipe with a lint-free cloth before measurement.
Cold waters can cause condensation on the sample cell or bubbles in the sample cell during color development. Examine the sample cell for condensation or bubbles. Remove condensation with a lint-free cloth. Invert the sample cell to remove bubbles.
Install the instrument cap over the cell holder before ZERO or READ is pushed.
After the test, immediately empty and rinse the sample cell. Rinse the sample cell and cap three times with deionized water.
Use tap water or deionized water for the blank (ozone-free water).
The AccuVac Ampul Snapper makes AccuVac Ampul tests easier to do. The AccuVac Ampul Snapper keeps the broken tip of the ampul, prevents exposure to the sample and provides controlled conditions for filling the ampule.
Review the Safety Data Sheets (MSDS/SDS) for the chemicals that are used. Use the recommended personal protective equipment.
Dispose of reacted solutions according to local, state and federal regulations. Refer to the Safety Data Sheets for disposal information for unused reagents. Refer to the environmental, health and safety staff for your facility and/or local regulatory agencies for further disposal information.

Items to collect

Description	Quantity
Low Range: Ozone AccuVac® Ampules, 0-0.25 mg/L	2
OR	
Mid-Range: Ozone AccuVac® Ampules, 0-0.75 mg/L	2
Beaker, 50 mL	2
Stoppers, for 18-mm tubes and AccuVac Ampuls	2
Water, ozone-free	varies

Refer to Consumables and replacement items on page 3 for order information.

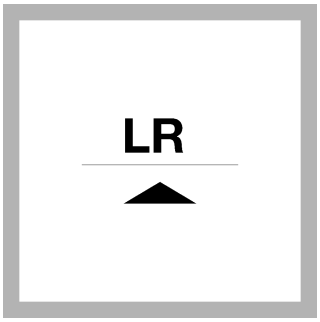
Sample collection

- Analyze the samples immediately. The samples cannot be preserved for later analysis.

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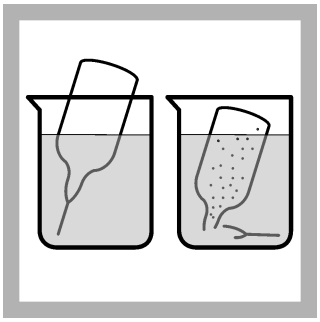
- The most important consideration during sample collection is to prevent the escape of ozone from the sample.
- Collect the sample gently and analyze immediately. Do not shake or stir the sample or allow the sample temperature to increase.
- Do not transfer the sample from one container to another unless absolutely necessary.

AccuVac® Ampul procedure

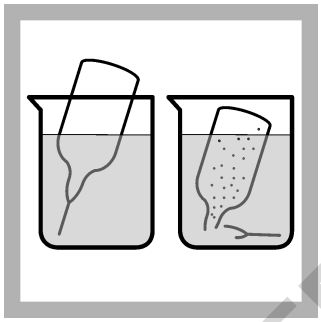


1. Set the instrument to low range (LR) when using low range AccuVac Ampuls or mid-range (MR) when using mid-range AccuVac Ampuls.

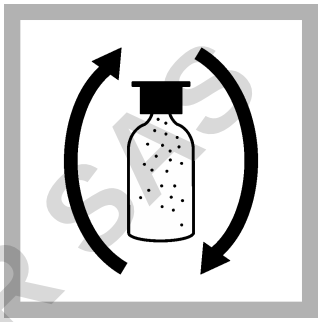
For DR300, push the up arrow button. For PCII, push the menu button, checkmark button, then the menu button again.



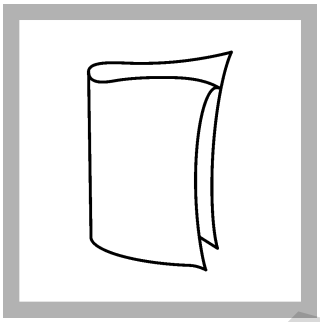
2. Prepare the blank: Pour at least 40 mL of ozone-free water in a 50-mL beaker. Fill an Indigo Ozone Reagent AccuVac Ampul with the ozone-free water. Keep the tip immersed while the Ampul fills fully, then immediately put the stopper on the tip.



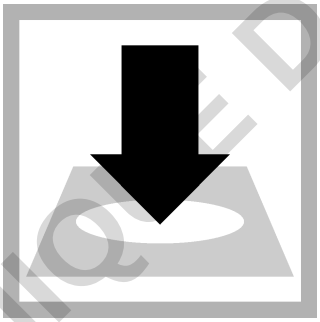
3. Prepare the sample: Pour at least 40 mL of sample in a 50-mL beaker. Fill an Indigo Ozone Reagent AccuVac Ampul with the sample. Keep the tip immersed while the Ampul fills fully, then immediately put the stopper on the tip.



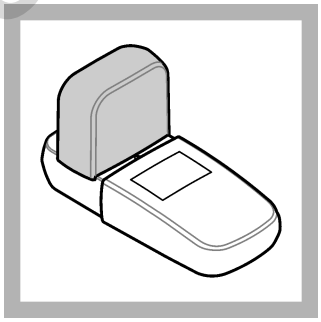
4. Quickly invert the AccuVac Ampuls several times to mix.
Some of the blue color will be bleached if ozone is in the sample.



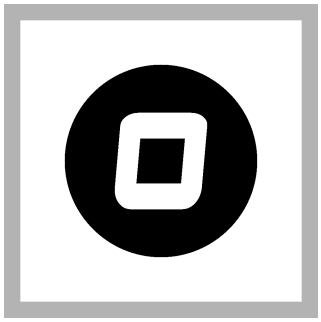
5. Clean the blank AccuVac Ampul.



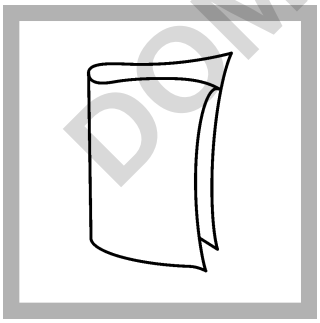
6. Insert the blank AccuVac Ampul into the cell holder.



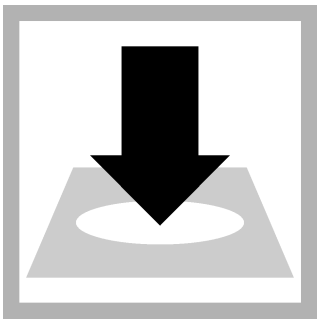
7. Install the instrument cap over the cell holder.



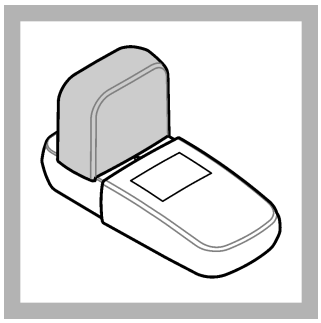
8. Push **ZERO**. The display shows “0.00”.



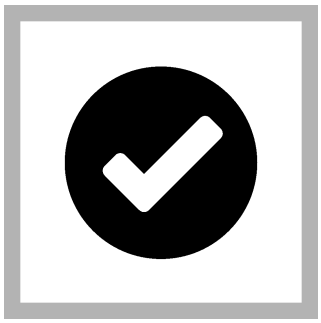
9. Clean the prepared sample AccuVac Ampul.



10. Insert the prepared sample AccuVac Ampul into the cell holder.



11. Install the instrument cap over the cell holder.



12. Push **READ**. Results show in mg/L ozone (O_3).

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Reagent stability

The indigo reagent is light-sensitive. Keep the unused AccuVac Ampuls in the dark. The indigo solution decomposes slowly under room light after the AccuVac Ampul is filled. The filled blank Ampul can be used for multiple measurements during the same day.

Summary of method

The reagent formulation adjusts the sample pH to 2.5 after the Ampule has filled. The indigo reagent reacts immediately and quantitatively with ozone. The blue color of indigo is bleached in proportion to the amount of ozone present in the sample. Other reagents in the formulation prevent chlorine interference. No transfer of sample is needed in the procedure, therefore ozone loss due to sampling is eliminated.

Consumables and replacement items

Required reagents

Description	Quantity/test	Unit	Item no.
Ozone AccuVac® Ampuls, 0–0.25 mg/L	2	25/pkg	2516025
Ozone AccuVac® Ampuls, 0–0.75 mg/L	2	25/pkg	2517025

Required apparatus

Description	Quantity/Test	Unit	Item no.
Beaker, 50 mL	2	each	50041H
Stoppers for 18-mm tubes and AccuVac Ampuls	2	6/pkg	173106

Optional reagents and apparatus

Description	Unit	Item no.
AccuVac® Ampul Snapper	each	2405200
Water, deionized	4 L	27256
SpecCheck™ Gel Secondary Standard Kit, Ozone, 0–0.75 mg/L set	each	2708000

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