

## Photometer Method

# BROMINE

## TEST FOR FREE, COMBINED AND TOTAL BROMINE IN WATER

### AUTOMATIC WAVELENGTH SELECTION

0 – 10.0 mg/l

Bromine and bromine-release compounds are used for the disinfection of swimming pool water, and in many other water treatment systems. Accurate measurement of the bromine residual is an essential aspect of control of these processes.

The bromine level can be expressed in terms of the free bromine, combined bromine or total bromine residuals. However free and combined bromine are both considered powerful disinfectants and it is not normally necessary to differentiate between these two forms. For the majority of applications therefore the measurement of the total residual is sufficient.

The Palintest DPD bromine method provides a simple means of measuring bromine residuals over the range 0 - 10.0 mg/l. A supplementary procedure can be used to differentiate between free and combined bromine if desired.

### Method

The Palintest bromine test uses the DPD method now internationally recognised as the standard method of testing for disinfectant residuals. In the DPD method the reagents are provided in tablet form for maximum convenience and simplicity of use.

Bromine reacts with diethyl-p-phenylene diamine (DPD) in buffered solution to produce a pink coloration. The intensity of the colour is proportional to the total bromine concentration and is measured using a Palintest Photometer.

For the separate determination of free and combined bromine, a supplementary procedure using sodium nitrite is used. The nitrite destroys the free bromine in the sample and the colour produced in the DPD test then corresponds to the combined bromine only. The free bromine content is thus obtained by difference between the total bromine and combined bromine results.

### Reagents and Equipment

Palintest DPD No 1 Clear Tablets  
Palintest DPD Nitrite Tablets  
Palintest Automatic Wavelength Selection Photometer  
Round Test Tubes, 10 ml glass (PT 595)

### Separation of Bromine Residuals

The photometer is programmed for both total and free bromine. Use program Phot 5 Total Bromine, then select the 'Follow On' option on screen to continue test for program Phot 6 Free Bromine. The Free Bromine residual is calculated automatically.

## Test Procedure

- 1 Rinse test tube with sample leaving a few drops in the tube.
- 2 Add and then crush the DPD #1 tablet in the few drops of the water sample until the tablet is thoroughly crushed.
- 3 Add the 10ml test solution, mix and seal the tube with the cap.
- 4 Gently invert the tube to remove any bubbles from the inner walls of the tube.
- 5 Select Phot 5 on the Photometer.
- 6 Take Photometer reading in usual manner (see Photometer instructions).
- 7 Result displayed is Total Bromine as mg/l Br.

For most purposes the test can be terminated at this stage. If it is desired to measure free and combined bromine, select 'Follow On' from screen options and proceed as indicated in the following section.

## Test Procedure - Free and Combined Bromine

- 1 Fill test tube with sample to the 10 ml mark. Add one DPD Nitrite tablet, crush and mix to dissolve.
- 2 Take a second clean test tube and add a few drops of the solution from the first tube.
- 3 Add and then crush the DPD #1 tablet in the few drops of the water sample until the tablet is thoroughly crushed.
- 4 Add the remaining 10ml of test solution, mix and seal the tube with the cap
- 5 Take Photometer reading in usual manner.
- 6 The Photometer carries out the necessary calculation and displays the Free Bromine residual as mg/l Br.

## Note

In systems containing both chlorine and bromine it is possible to differentiate between the chlorine and bromine residuals using a supplementary procedure involving Palintest DPD Glycine tablets. Details of this procedure are given on a separate instruction sheet.

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# MEASUREMENT OF BROMINE IN THE PRESENCE OF CHLORINE

It is possible to determine bromine in the presence of chlorine, and to separate between bromine and chlorine residuals. This instruction sheet gives the test procedures for these determinations.

## Reagents and Equipment

Palintest DPD No 1 Tablets

Palintest DPD No 3 Tablets

Palintest Glycine Tablets

Equipment as per Instruction Sheet PHOT.5.AUTO

## Test Procedure - Total Bromine (in the Presence of Chlorine)

- 1 Fill a test tube with sample to the 10 ml mark. Add one DPD Glycine tablet, crush and mix to dissolve.
- 2 Take a second clean test tube and add a few drops of solution from the first tube.
- 3 Add and then crush the DPD No 1 tablet in the few drops of the water sample until the tablet is thoroughly crushed.
- 4 Add the treated 10 ml test solution, mix and seal the tube with the cap.
- 5 Gently invert the tube to remove any bubbles from the inner walls of the tube.
- 6 Select Phot 5 on the photometer.
- 7 Take the test reading using the photometer.
- 8 The result obtained represents the total bromine residual as mg/l Br<sub>2</sub> (Result A).

For most purposes the test can be terminated at this stage. However if it is desired to measure free and combined chlorine, proceed as indicated in the following section :-

## Test Procedure - Free and Combined Chlorine (in the Presence of Bromine)

- 1 Rinse the test tube with sample leaving a few drops in the tube.
- 2 Add and then crush the DPD #1 tablet in the few drops of the water sample until the tablet is thoroughly crushed.
- 3 Add the 10ml test solution, mix and seal the tube with the cap.
- 4 Gently invert the tube to remove any bubbles from the inner walls of the tube
- 5 Select Phot 5 on the photometer.
- 6 Take the test reading using the photometer.
- 7 The result obtained represents total bromine plus free chlorine as mg/l Br<sub>2</sub> (Result B).
- 8 Continue the test by adding one DPD No 3 tablet. Crush and mix to dissolve.
- 9 Allow the tube to stand for two minutes and then take the reading on Phot 5 using the photometer.
- 10 The result obtained represents total bromine plus free chlorine plus combined chlorine as mg/l Br<sub>2</sub> (Result C).

## Calculation of Results

The various residuals can be calculated from the above results as follows :-

$$\text{Total Bromine (as Br}_2\text{)} = \text{Result A}$$

$$\text{Free Chlorine (as Cl}_2\text{)} = (\text{Result B} - \text{Result A}) \times 0.44$$

$$\text{Combined Chlorine (as Cl}_2\text{)} = (\text{Result C} - \text{Result B}) \times 0.44$$

$$\text{Total Chlorine (as Cl}_2\text{)} = (\text{Result C} - \text{Result A}) \times 0.44$$