Taylor's FAS-DPD Drop Test Kits

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INTRODUCTION

In recent years, professionals in the pool and spa industry have progressed from using orthotolidine (OT) to N,N-diethyl-p-phenylene-diamine (DPD) when determining chlorine levels with color-matching tests.

The OT method only measures total chlorine—the sum of active and spent sanitizer—which makes maintaining the correct residual a guessing game. Because of this, **regulatory authorities do not permit OT testing in commercial pools.** In addition, orthotolidine contains hydrochloric acid, making it more costly to ship than DPD and therefore more costly to buy.

Unlike OT, the DPD method will distinguish between free available chlorine and total chlorine. By subtracting the free chlorine reading from the total chlorine reading, the amount of combined chlorine in the water can be known. Combined chlorine is not an effective sanitizer. Its presence causes eye and mucous membrane irritation and the characteristic "chlorine" odor of a poorly maintained pool.

Combined chlorine is eliminated by superchlorination. Calculations for the breakpoint dosage depend on knowing the level of combined chlorine in the water, which is why the DPD method is superior to the OT method for testing chlorine-sanitized pools. However, bromine is an effective sanitizer in all its forms. Because of this, either OT or DPD may be used to test bromine pools and spas.

The latest trend in commercial pools with chlorine sanitizer has been the FAS-DPD titration method, which can measure **free and combined chlorine as low as 0.2 ppm** (using a 25 mL sample size) **and as high as 20 ppm** (using a 10 mL sample size).

To get the free chlorine reading, a buffered DPD indicator powder is added to the water sample. It reacts with the chlorine to produce the pink color characteristic of the standard DPD test. Ferrous ammonium sulfate (FAS) titrating reagent is then added until the pink color permanently disappears, signaling the endpoint.

The distinct change from a vibrant pink to no color at all eliminates the need for color matching. This feature comes in handy when testing samples with high levels of sanitizer because the user does not have to distinguish between relatively close printed-color gradations. This test is also a boon for colorblind users.

Kits with FAS-DPD measure free and combined chlorine precisely without color matching (K-2006 shown). Watch a video demonstration on our website.

The second half of the FAS-DPD test determines the amount of combined chlorine present. It too involves turning the sample from a vibrant pink to a colorless endpoint.

FAS-DPD is available in stand-alone kits to measure chlorine or bromine, and in combination with other common tests. Supplement this test with **Deox Reagent** when testing chlorine in the presence of monopersulfate shocks or interference will cause a false-high combined chlorine reading.

The Unit Dose Dispenser™ for DPD powder (#9250) is available for purchase.

FAS-DPD TEST KITS

K-1515-A
Drop test measuring free & combined chlorine;
1 drop = 0.2 or 0.5 ppm; .75 oz. bottles

K-1515-C
Same as above but with 2 oz. bottles

K-1517-A
Drop test measuring total bromine;
1 drop = 0.5 or 1.25 ppm; .75 oz. bottles

K-1517-C
Same as above but with 2 oz. bottles

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FAS-DPD TEST KITS (cont'd)

K-1518
Drop test measuring free & combined chlorine accurately in the presence of monopersulfate shocks; 1 drop = 0.2 ppm chlorine/1 drop = 0.2 ppm monopersulfate as chlorine; 2 oz. bottles

K-2006
***Complete*™:** free & combined chlorine (using **FAS-DPD**) 1 drop = 0.2 or 0.5 ppm; pH (with acid & base demand); total alkalinity; calcium hardness; cyanuric acid; .75 oz. bottles
Spanish (K-2006S, K-2006S-6)

K-2006-SALT
***Complete*™:** Same as K-2006 plus a test for sodium chloride

K-2006C
***Service Complete*™:** Same as K-2006 but with 2 oz. bottles
Spanish (K-2006CS, K-2006CS-8)

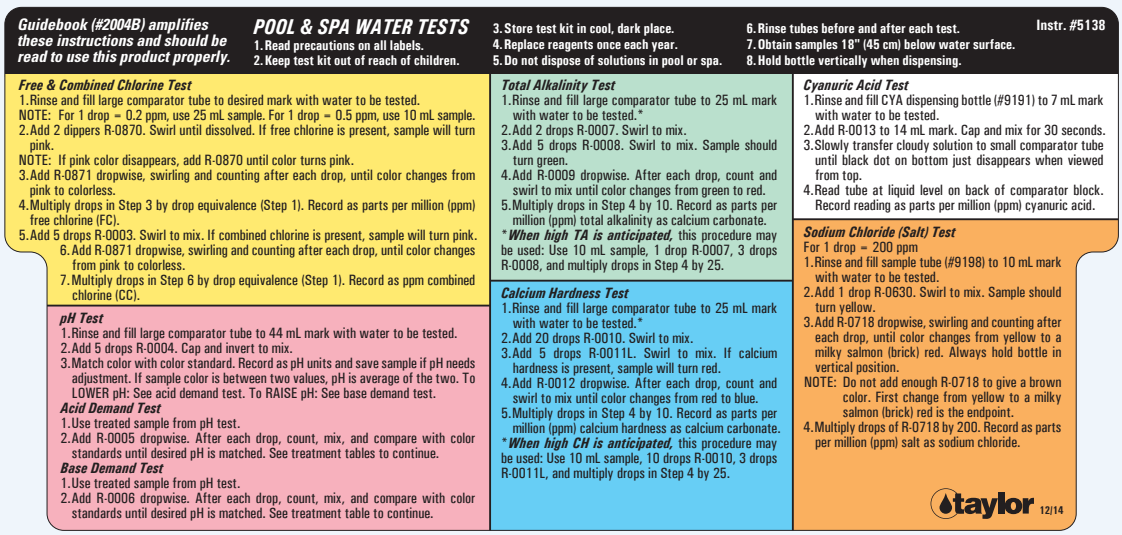
K-2006C-SALT
***Service Complete*™:** Same as K-2006C plus a test for sodium chloride

K-2106
***Complete*™:** total bromine (using **FAS-DPD**) 1 drop = 0.5 or 1.25 ppm; pH (with acid & base demand); total alkalinity; calcium hardness; .75 oz. bottles
Spanish (K-2106S, K-2106S-6)

K-2009
***Pool Inspector*™:** free & combined chlorine (using **FAS-DPD**) 1 drop = 0.2 or 0.5 ppm; pH; cyanuric acid (contains 6 bottles of CYA reagent, 4 more than the K-2006); .75 oz. bottles

REPRESENTATIVE TEST PROCEDURE

Reproduced from K-2006-SALT instruction:



Guidebook (#2004B) amplifies these instructions and should be read to use this product properly.

POOL & SPA WATER TESTS
1. Read precautions on all labels.
2. Keep test kit out of reach of children.
3. Store test kit in cool, dark place.
4. Replace reagents once each year.
5. Do not dispose of solutions in pool or spa.
6. Rinse tubes before and after each test.
7. Obtain samples 18" (45 cm) below water surface.
8. Hold bottle vertically when dispensing.

Instr. #5138

Free & Combined Chlorine Test
1. Rinse and fill large comparator tube to desired mark with water to be tested.
NOTE: For 1 drop = 0.2 ppm, use 25 mL sample. For 1 drop = 0.5 ppm, use 10 mL sample.
2. Add 2 dippers R-0870. Swirl until dissolved. If free chlorine is present, sample will turn pink.
NOTE: If pink color disappears, add R-0870 until color turns pink.
3. Add R-0871 dropwise, swirling and counting after each drop, until color changes from pink to colorless.
4. Multiply drops in Step 3 by drop equivalence (Step 1). Record as parts per million (ppm) free chlorine (FC).
5. Add 5 drops R-0003. Swirl to mix. If combined chlorine is present, sample will turn pink.
6. Add R-0871 dropwise, swirling and counting after each drop, until color changes from pink to colorless.
7. Multiply drops in Step 6 by drop equivalence (Step 1). Record as ppm combined chlorine (CC).

pH Test
1. Rinse and fill large comparator tube to 44 mL mark with water to be tested.
2. Add 5 drops R-0004. Cap and invert to mix.
3. Match color with color standard. Record as pH units and save sample if pH needs adjustment. If sample color is between two values, pH is average of the two. To LOWER pH: See acid demand test. To RAISE pH: See base demand test.

Acid Demand Test
1. Use treated sample from pH test.
2. Add R-0005 dropwise. After each drop, count, mix, and compare with color standards until desired pH is matched. See treatment tables to continue.

Base Demand Test
1. Use treated sample from pH test.
2. Add R-0006 dropwise. After each drop, count, mix, and compare with color standards until desired pH is matched. See treatment table to continue.

Total Alkalinity Test
1. Rinse and fill large comparator tube to 25 mL mark with water to be tested.*
2. Add 2 drops R-0007. Swirl to mix.
3. Add 5 drops R-0008. Swirl to mix. Sample should turn green.
4. Add R-0009 dropwise. After each drop, count and swirl to mix until color changes from green to red.
5. Multiply drops in Step 4 by 10. Record as parts per million (ppm) total alkalinity as calcium carbonate.
**When high TA is anticipated,* this procedure may be used: Use 10 mL sample, 1 drop R-0007, 3 drops R-0008, and multiply drops in Step 4 by 25.

Calcium Hardness Test
1. Rinse and fill large comparator tube to 25 mL mark with water to be tested.*
2. Add 20 drops R-0010. Swirl to mix.
3. Add 5 drops R-0011L. Swirl to mix. If calcium hardness is present, sample will turn red.
4. Add R-0012 dropwise. After each drop, count and swirl to mix until color changes from red to blue.
5. Multiply drops in Step 4 by 10. Record as parts per million (ppm) calcium hardness as calcium carbonate.
**When high CH is anticipated,* this procedure may be used: Use 10 mL sample, 10 drops R-0010, 3 drops R-0011L, and multiply drops in Step 4 by 25.

Cyanuric Acid Test
1. Rinse and fill CYA dispensing bottle (#9191) to 7 mL mark with water to be tested.
2. Add R-0013 to 14 mL mark. Cap and mix for 30 seconds.
3. Slowly transfer cloudy solution to small comparator tube until black dot on bottom just disappears when viewed from top.
4. Read tube at liquid level on back of comparator block. Record reading as parts per million (ppm) cyanuric acid.

Sodium Chloride (Salt) Test
For 1 drop = 200 ppm
1. Rinse and fill sample tube (#9198) to 10 mL mark with water to be tested.
2. Add 1 drop R-0630. Swirl to mix. Sample should turn yellow.
3. Add R-0718 dropwise, swirling and counting after each drop, until color changes from yellow to a milky salmon (brick) red. Always hold bottle in vertical position.
NOTE: Do not add enough R-0718 to give a brown color. First change from yellow to a milky salmon (brick) red is the endpoint.
4. Multiply drops of R-0718 by 200. Record as parts per million (ppm) salt as sodium chloride.

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USER BENEFITS

- Titrations do not require the ability to match colors, only the ability to see the **permanent color change** at the end-point of the reaction.
- Test kits **come complete** with all necessary reagents and equipment.
- **Waterproof instructions** are printed on plastic-impregnated paper that resists fading and tearing.
- Custom-molded, durable plastic cases provide **safe storage** for all tests and room to store supplemental tests or extra reagents.
- **Proven chemistries** are based on *Standard Methods for the Examination of Water and Wastewater,* APHA, Washington, DC, and/or *American Society for Testing and Materials,* ASTM, Philadelphia, PA. Some methods use proprietary chemistry developed by Taylor Technologies.

ALSO AVAILABLE

- **Unit Dose Dispenser** (#9250) that fits over the vial of DPD powder. When cranked, it serves up the correct amount to run the test, while protecting the powder from exposure to air and humidity.
- **Deox Reagent** to eliminate interference with the FAS-DPD chlorine test from monopersulfate (non-chlorine) shock treatments in the water; K-2041 (.75 oz.) or K-2042 (2 oz.).
- A wide array of single- and multiparameter kits featuring color-matching and/or drop-count tests.
- Taylor's **TTi® Colorimeter** (M-2000); test more than a dozen parameters commonly encountered in pool/spa settings and transfer results to a PC database.
- Myron L Company portable instruments that may be purchased alone or paired with our reagents.
- Testing supplies and kit replacement parts (e.g., burets, flasks, test tubes, and test cells).
- **Video demonstrations** for new users posted on our website.
- Toll-free technical assistance at **800-TEST KIT.**

Taylor's FAS-DPD Test Kits for Chlorine and Bromine

INTRODUCTION

Heightened concern about bacteria levels in cooling waters has resulted in increased applications of chlorine and bromine. Optimal control of these oxidizing biocides determines their effectiveness and the economy of the treatment program. To date, the DPD test (N,N-diethyl-p-phenylene-diamine) has been the most popular method for monitoring chlorine and bromine levels. The analyst matches the pink color that develops in the treated water sample when the oxidizer is present to a set of color standards, or uses an electronic colorimeter to make this reading.

However, there is an excellent alternative available to industrial water treaters called FAS-DPD. This non-instrument method doesn't require color matching. Ferrous ammonium sulfate is added drop by drop to a sample containing DPD indicator. The number of drops needed to turn the sample from pink to colorless is multiplied by the chosen drop equivalency to determine the concentration of the oxidizer.

The FAS-DPD method has several advantages. It's less expensive than using a meter. There's no waiting time for full color development. **The analyst does not have to be able to distinguish between gradations of color**—even a colorblind user can see the color change at the endpoint of the titration from a color to no color. It allows users to measure free and combined chlorine, as low as 0.2 ppm (with a 25 mL sample) and as high as 20 ppm (with a 10 mL sample); added together, this is the total chorine concentration. Total bromine may be determined directly, as low as 0.5 ppm (with a 25 mL sample) and as high as 50 ppm (with a 10 mL sample).

Simple, fast, accurate, and inexpensive … four reasons why you should try the FAS-DPD method for monitoring oxidizing biocides in cooling waters!

With this titrimetric test, buffered DPD indicator powder is added to the cooling water sample. It reacts with any chlorine or bromine biocide present to produce the pink color characteristic of a standard DPD color-comparison test. FAS-DPD titrating reagent is then added dropwise until the color permanently disappears, signaling the endpoint. Even someone who has difficulty matching shades of red can see the change from pink to color*less* (K-1515-C shown).

FAS-DPD TEST KITS

K-1515-C
Drop test (uses DPD #3);
1 drop = 0.2 or 0.5 ppm **free** or **combined** chlorine (Cl_2)

K-1516
Drop test (uses KI crystals);
1 drop = 0.2 or 0.5 ppm **free** or **combined** chlorine (Cl_2)

K-1517-C
Drop test;
1 drop = 0.5 or 1.25 ppm **total** bromine (Br_2)

K-0445
Buret titration (reagent pack);
1 mL = 0.1 mg **free** or **combined** chlorine (Cl_2)

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USER BENEFITS

- Titrations do not require the ability to match colors, only the ability to see the **permanent color change** at the end-point of the reaction.
- These test kits are practical for both **on- and off-site** testing.
- Test kits **come complete** with all necessary reagents and equipment.
- **Waterproof instructions** are printed on plastic-impregnated paper that resists fading and tearing.
- **Picture guides** to color transitions in the test reassure new users.
- Custom-molded, durable plastic cases provide **safe storage** for all tests.
- **Proven chemistries** are based on *Standard Methods for the Examination of Water and Wastewater,* APHA, Washington, DC, and/or *American Society for Testing and Materials,* ASTM, Philadelphia, PA. Some methods use proprietary chemistry developed by Taylor Technologies.

ALSO AVAILABLE

- Tests for **chlorine dioxide** (K-1502); **ozone** (K-1818 or K-1822); **hydrogen peroxide** (K-1443, K-1825, or K-1826); and **peracetic acid** (K-1546).
- SampleSizer® for 10/25 mL test volumes (#6190) and SpeedStir® magnetic stirrer (#9265) save time for frequent testers.
- A wide array of single- and multiparameter kits featuring color-matching and/or drop-count tests.
- Taylor's TTi® Colorimeter (M-3000); test 30+ parameters commonly encountered in commercial and industrial settings and transfer results to a PC database.
- Testing supplies and kit replacement parts (e.g., burets, flasks, test tubes, and test cells).
- Myron L Company portable instruments that may be purchased alone or paired with our reagents.
- **Video demonstrations** for new users posted on our website.
- Toll-free technical assistance at **800-TEST KIT.**

REPRESENTATIVE TEST PROCEDURE

Reproduced from K-1515-C instruction:

DROP TEST
FAS-DPD CHLORINE (1 drop = 0.2 or 0.5 ppm)

Instr. #5216

COMPONENTS:

1 x 5216	Instruction
1 x 9198Y	Sample Tube, Graduated, 25 mL, plastic w/cap and yellow dot
1 x R-0003-C	DPD Reagent #3, 2 oz, DB
1 x R-0870-I	DPD Powder, 10 g
2 x R-0871-C	FAS-DPD Titrating Reagent (chlorine),2 oz, DB

TO ORDER REPLACEMENT PARTS AND REAGENTS CALL TOLL-FREE 800-TEST KIT (800-837-8548).

PROCEDURE:

CAREFULLY READ AND FOLLOW PRECAUTIONS ON REAGENT LABELS. KEEP REAGENTS AWAY FROM CHILDREN.

Chlorine Tests (Free & Combined)

1. Rinse and fill sample tube (#9198Y) to desired mark with water to be tested (Fig. 1).

NOTE: For 1 drop = 0.2 ppm, use 25 mL sample.
For 1 drop = 0.5 ppm, use 10 mL sample.

2. Add 2 dippers R-0870 DPD Powder. Swirl until dissolved. Sample will turn pink (Fig. 2) if free chlorine is present.

NOTE: If pink color disappears, add R-0870 DPD Powder until color turns pink.

3. Add R-0871 FAS-DPD Titrating Reagent (chlorine) dropwise, swirling and counting after each drop, until color changes from pink to colorless. Always hold bottle in vertical position.
4. Multiply drops in Step 3 by drop equivalence (Step 1). Record as parts per million (ppm) free chlorine (FC).
5. Add 5 drops R-0003 DPD Reagent #3. Swirl to mix. Sample will turn pink if combined chlorine is present.
6. Add R-0871 FAS-DPD Titrating Reagent (chlorine) dropwise, swirling and counting after each drop, until color changes from pink to colorless. Always hold bottle in vertical position.
7. Multiply drops in Step 6 by drop equivalence (Step 1). Record as ppm combined chlorine (CC).

Fig. 1

Fig. 2

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