

# eXact®

# CHLORINE Plus

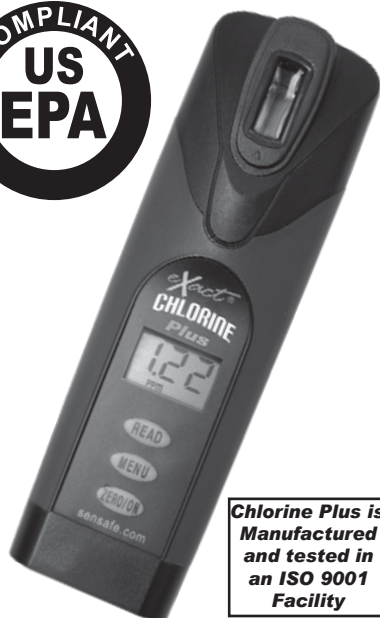
Revision 04/12/12  
486696-PLUSK Kit

## Advanced Photometer System Instruction Manual

**IDEAL FOR DRINKING WATER, POOLS & SPAS,  
ENVIRONMENTAL, and FOOD & BEVERAGE TESTING**

**USEPA, DIN, & ISO Compliant for Free & Total Chlorine Testing  
(4500-CL G, DIN Standard 38 408 G4, ISO 7393/2)**

U.S. Patent No. 7,333,194, U.S. Patent No. 7,491,546, South African Patent No. 2007/0628 and International Patent applications including International Patent Appln. No. PCT/US2005/033985; and Eur. Pat. App. 1,725,864



**Chlorine Plus is  
Manufactured  
and tested in  
an ISO 9001  
Facility**

**The eXact® Chlorine Plus Advanced  
Photometer System has been  
designed for use with the eXact® Strip  
Micro reagent delivery system.**

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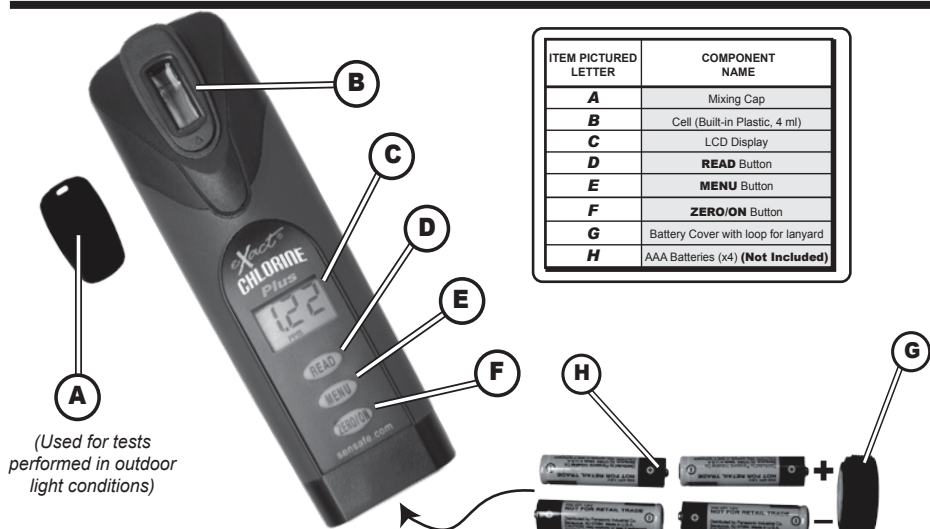


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# eXact® Chlorine Plus Photometer



## eXact® Chlorine Plus Meter Specifications

<b>Measurement Method:</b>	Photometric
<b>Light Source:</b>	Light Emitting Diode (LED)
<b>Wavelength:</b>	525 nm
<b>Transmission Range:</b>	100 - 0.00 %T
<b>Photometric Precision:</b>	+/- 0.1/0.01 %T
<b>Automatic Range Selection:</b>	See Specifications below
<b>Display:</b>	3-digit customized liquid crystal display with annunciators
<b>CELL Pathlength:</b>	20mm

<b>Cell Chamber:</b>	Custom-molded, proprietary, PET plastic fused into chamber, non-removable
<b>Sample Required:</b>	4 ml (0.13 oz)
<b>Operating Temperature Range:</b>	0 - 50°C (32° - 122°F)
<b>Power Supply:</b>	(4) AAA alkaline batteries (Not Included)
<b>Battery Life:</b>	>2000 tests with alkaline batteries
<b>Electromagnetic Compliance:</b>	Emitted Interference - EN 61326 (EMC)
<b>Waterproof Rating:</b>	Exceeds IP67
<b>Weight:</b>	Instrument: 140 g (5 oz)
<b>Dimensions:</b>	Instrument: 5 (W) x 3.5 (D) x 16.5 (H) cm; (2 x 1.4 x 6.375 in)

## We offer a “Green” Alternative

eXact® Chlorine Plus has been designed to offer the user a more “Green” and cost-effective alternative to testing. Instead of using a 10ml water sample, eXact® Chlorine Plus uses a 4ml water sample, which uses up to 60% less chemical per test. The accuracy of the meter is maintained by designing the photo cell with a 20mm pathlength.

### eXact® Chlorine Plus Specifications

Menu	Tests for*	Range	Resolution	Typical Accuracy
<b>CL1</b>	<b>Free Chlorine (DPD-1) &amp; Total Chlorine (DPD-3)</b>	0.00-11.0 ppm	0.01 (0-5.99 ppm)	±3% (0-3.00 ppm)
			0.1 (6-11 ppm)	±7% (3.01-5.99 ppm)
<b>bR2</b>	<b>Bromine</b>	0.0-14 ppm	0.01 (0-5.99 ppm)	±3% (0-2.50 ppm)
			0.1 (6-14 ppm)	±6% (2.51-14 ppm)
<b>O3</b>	<b>Ozone</b>	0.01-9 ppm	0.01 (0.01-5.99 ppm)	±8% (0.01-5.99 ppm)
			0.1 (6-9 ppm)	±16% (6.0-9 ppm)
<b>Cd4</b>	<b>Chlorine Dioxide</b>	0-12 ppm	0.01 (0-5 ppm)	±8%
			0.1 (5.01-12 ppm)	
<b>PA5</b>	<b>Peracetic Acid</b>	0-9 ppm	0.01 (0-5 ppm)	±8% (0-5.00 ppm)
			0.1 (5.1-9 ppm)	±9% (5.1-9 ppm)
<b>HP6</b>	<b>Hydrogen Peroxide</b>	0-3 ppm	0.01 (0-1 ppm)	±10% (0-1.00 ppm)
			0.1 (1.1-3 ppm)	±13% (1.1-3 ppm)
<b>TR7</b>	<b>Transmission</b>	99.9-0.01 %T	0.01 (0.01-9.99 %T)	±1%
			0.1 (10-99.9 %T)	
<b>HR8</b>	<b>High Range Chlorine</b>	0-300 ppm	1	±8%

\* Performance verified with various water samples with optimal water temperatures at 10 – 40°C / 50 – 104°F.

Optimal water temperature for High Range Chlorine test is 0-40°C / 32-104°F.

R041212

## About Your eXact® Chlorine Plus Instrument

In order to save power, the meter is designed to turn off after 3 minutes (timed from the last button pressed). Should the meter turn off in the middle of a test, the last stored zero in the meter will remain valid when the meter is turned on again. Also, the test result is stored in memory for easy retrieval.

The eXact® Chlorine Plus meter is controlled by three buttons:

1. **ZERO/ON:** When first pressed, this button turns the meter on. When the meter is on and this button is pressed, it zeroes the sample in the cell. Once the meter is zeroed, this zero value applies to all parameters and is stored and retained even when meter turns off. However, it is recommended that each new water sample analyzed is zeroed before testing, to maximize sensitivity and accuracy.
2. **MENU:** With each press, the MENU button advances through the tests in the following sequence: CL1, bR2, O3, Cd4, PA5, HP6, Tr7, HR8. Each test menu can store up to 20 results. To **retrieve the stored results**, go to the desired test using the MENU key. When the desired test is displayed, **press and hold down the MENU key**. Continue holding down the MENU key to scroll the stored results for that test, starting with the most recent result. The meter will display, from memory, the last 20 readings in sequence beginning with -20, which is the latest result, followed by -19, which is the 2<sup>nd</sup> latest result, etc; and finally -01, which is the oldest result retained. Only the last 20 readings are stored in each menu. This meter is able to store 160 results in memory (20 in each menu).
3. **READ:** When pressed once, this button starts the timer for the parameter being tested. When pressed a second time the meter exits the timer and immediately prepares to colorimetrically measure the sample, and simultaneously stores the measurement in memory.

If the parameter being measured is below or above the detection range, the display will show "**LO**" (Under Range) or "**HI**" (Over Range), respectively. This feature is menu specific and does not apply to all parameters.

## About The Accuracy / Calibration Of The Chlorine Plus System

All tests have been calibrated using certified reference standards and standard analytical spectrophotometric methods. The algorithm in the software of the eXact® Chlorine Plus Systems mirrors the AWWA, US EPA, DIN, and ISO reference test methods for chlorine. Studies show that the eXact® Chlorine Plus System, with the eXact® Strip Micro CL (DPD-1), repeatedly agrees with an EPA Compliant reference method greater than 99% ( $R^2 = 0.9989$ , 0 - 6.0 ppm - see page 12). The eXact® Chlorine Plus Advanced Photometric System has been factory calibrated for your convenience. You can expect the fixed calibrations in the meter to be valid for the life of the meter because of the quality, Long-Life LED, the photo cell, and the software as written into the meter. This is why the meter comes with a 2-Year Warranty. For verification of photometer calibration, the eXact® 525nm 2.0 ppm Reference Standard (part #486602-II) is available for purchase (see page 10).

## Compliance Verification for Free and Total Chlorine Testing

This DPD test system is accepted by most health departments because this test is USEPA (DIN Standard 38 408 G4, ISO 7393/2) accepted for testing requirements for Free and Total Chlorine. The Chlorine Plus meter uses a wavelength of 525nm; and the compliance requirement is that the colorimeter wavelength is between 490 and 530nm. The eXact® Strip Micro CL (DPD-1) uses the same reagents and proportions, and the resulting solution pH is maintained between 6.2 and 6.5 as specified by AWWA (American Water Works Association) method 4500-Cl G. It should be understood that the USEPA does not "approve" commercial DPD delivery systems such as reagent powder pillows, tablets, dispensers, or eXact® Strip DPD delivery devices. The eXact® Strip Micro CL (DPD-1) for Free Chlorine, and the eXact® Strip Micro CL (DPD-3) or the eXact® Strip Micro CL (DPD-4) for Total Chlorine meet your reportable testing requirements because the eXact® Strip Micro CL delivers the same chemicals in identical proportions (see table below); therefore, the system is compliant. Likewise, AWWA proportions are followed as required for Total Chlorine measurements using Potassium Iodide.

<b>Component (Free Chlorine)</b>	<b>AWWA 4500-Cl G</b>	<b>eXact® DPD-1</b>
Anhydrous DPD sulfate	1.5%	1.5%
Anhydrous Na <sub>2</sub> HPO <sub>4</sub>	33.4%	33.4%
Anhydrous KH <sub>2</sub> PO <sub>4</sub> Na <sub>2</sub>	64.0%	64.0%
EDTA	1.1%	1.1%



**1**

## **REMOVE STRIP**

Remove one (1) **eXact® Strip Micro CL (DPD-1), Part No. 486637** from the bottle before beginning the test. Set the strip in a dry, convenient place and recap the bottle immediately.



**2**

## **TURN METER ON**

Press the **ZERO/ON** button to power the meter on; the display will show all annunciators, then the current MENU selection, followed by the last reading.



**3**

## **SELECT TEST: CL1**

Press and re-press the **MENU** button until the display shows the parameter **CL1**.



**4**

## **RINSE AND FILL CELL WITH SAMPLE**

Rinse the **CELL** at least 3 times with the water sample you will be testing - rinsing minimizes the potential for cross-contamination from a previous test. Finally, fill cell to capacity (4ml) with the water sample.



**5**

## **ZERO METER\***

Press the **ZERO/ON** button. The cursor will move across the display followed by **0.00 PPM**. Sample is ready for testing.



**6**

## **DIP STRIP AND PRESS "READ"**

Dip the **eXact® Strip Micro CL (DPD-1), Part No. 486637** into the **CELL** and immediately press **READ**. This starts the **20 SECOND** countdown timer. During this time move the strip in a gentle back and forth motion (approx. 2 strokes/sec). **Remove and discard the strip after "1" on the display disappears.\***



**7**

## **RECORD RESULT DISPLAYED**

The cursor will move across the display while the meter prepares to measure the sample. Record result displayed (this result is automatically stored in CL1).

**DO NOT** discard the sample from the Free Chlorine test if you are planning to run eXact® Strip Micro DPD-3 (Total Chlorine) Procedure. Move directly to steps 8-10 on page 5. Otherwise, rinse the cell immediately.

**NOTE:** N,N-diethyl-p-phenylenediamine (DPD) also reacts to form a magenta color with Ozone, Total Chlorine, Permanganate, Iodine, and other oxidizers.

\*NOTE: When testing outdoors (sunlight), for best accuracy, use the Mixing Cap/Cell Cover when Zeroing and Reading the sample.

This procedure is only valid when run as a continuation of the eXact® Strip Micro CL (DPD-1) Test Procedure on page 4.

8

**REMOVE STRIP**

Remove one (1) **eXact® Strip Micro CL (DPD-3), Part No. 486638** from the bottle before beginning the test. Set the strip in a dry, convenient place and recap the bottle immediately.

9

**DIP STRIP AND PRESS “READ”**

Dip the **eXact® Strip Micro CL (DPD-3)** into the **CELL** and immediately press **READ**. This starts the **20 SECOND** countdown timer. During this time move the strip in a gentle back and forth motion (approx. 2 strokes/sec). **Remove and discard the strip when “1” on the display disappears.** The cursor will move across the display while the meter prepares to measure the sample. This result is automatically stored in CL1 (NOTE: The Iodide added with DPD-3 will, in the presence of Combined Chlorine or Chloramines, convert into Iodine).

10

**PRESS READ AGAIN**

Press **READ** again and the meter will count down and display the next reading. If this reading matches the previous result, then record this as the Total Chlorine result. This value is automatically stored in CL1. After testing is completed, rinse cell immediately. Record the Total Chlorine as the highest value the meter displayed.

**\*NOTE:** Standard Method (4500-Cl G, procedure for total chlorine) requires the reading to be made after 2 minutes from the time the KI is added. For compliance testing, you must time the two minutes and then make your measurement. NOTE: From testing in our lab, water samples above 70°F (20°C), generally, reach a stabilized reading quicker than 2 minutes.

CL1: Chlorine and Iodine react with N,N-diethyl-p-phenylenediamine as it is released from the strip to form a magenta color, directly proportional to the Chlorine concentration. (Ozone, Bromine, and Permanganate also form the same color)

**eXact® Strip Micro CL (DPD-1/DPD-3/DPD-4) Interferences (part nos. 486637/486638/486670)**

Interfering Substance	Interfering Levels & Treatments
Acidity	If sample has acidity above 150mg/L CaCO <sub>3</sub> test may not develop full color. Neutralize to pH 6.0 to 7.0 with 0.5N Sodium hydroxide.
Alkalinity	If sample has alkalinity above 200mg/L CaCO <sub>3</sub> test may not develop full color. Neutralize to pH 6.0 to 7.0 with 0.5N Sulfuric acid.
Bromine & Bromamines, Br <sub>2</sub>	Color similar to free chlorine reaction at all levels.
Chlorine Dioxide, ClO <sub>2</sub>	Color similar to free chlorine reaction at all levels.
Copper, Cu <sup>+2</sup>	Color development is reduced above 10 ppm (mg/L).
Iodine, I <sub>2</sub>	Color similar to free chlorine reaction at all levels.
Manganese, oxidized (Mn <sup>+4</sup> , Mn <sup>+7</sup> ) or Chromium, oxidized (Cr <sup>+6</sup> )	See AWWA procedure 4500-CL F, 1(d) for removal of interferences.
Monochloramines (NH <sub>2</sub> Cl) (applies to DPD-1 only)	Monochloramine interferences are known to occur in free chlorine DPD methods. This interference is dependent on temperature and monochloramine concentration.
Ozone, O <sub>3</sub>	Color similar to free chlorine reaction at all levels.
Peroxides	Interference is possible.
pH	Typical pH samples of potable water with a pH of 6.0 to 9.0 are OK. If outside this range adjust to pH 6.0 to 7.0 using acid (0.5N Sulfuric acid) or base (0.5N Sodium hydroxide).

**MENU****DPD-4 (Total Chlorine) Test Procedure****CL****CL1****1 REMOVE STRIP**

Remove one (1) **eXact® Strip Micro CL (DPD-4), Part No. 486670** from the bottle before beginning the test. Set the strip in a dry, convenient place and recap the bottle immediately.

**2 TURN METER ON**

Press the **ZERO/ON** button to power the meter on; the display will show all annunciators, then the current MENU selection, followed by the last reading.

**3 SELECT TEST: CL1**

Press and re-press the **MENU** button until the display shows the parameter **CL1**.

**4 FILL METER WITH SAMPLE**

Rinse the **CELL** at least 3 times with the water sample you will be testing - rinsing minimizes the potential for cross- contamination from a previous test. Finally, fill cell to capacity (4ml) with the water sample.

**5 ZERO METER\***

Press the **ZERO/ON** button. The cursor will move across the display, followed by **0.00 PPM**. Sample is ready for testing.

**6 DIP STRIP AND PRESS "READ"**

Dip the **eXact® Strip Micro CL (DPD-4), Part No. 486670** into the **CELL** and immediately press **READ**. This starts the **20 SECOND** countdown timer. During this time move the strip in a gentle back and forth motion (approx. 2 strokes/sec). **Remove and discard the strip after "1" on the display disappears\***. The cursor will move across the display while the meter prepares to measure the sample. Record result displayed (this result is automatically stored in CL1).

**7 PRESS READ AGAIN**

Press **READ** again and the meter will count down and display the next Total Chlorine result. If this reading matches the previous result, then record this as Total Chlorine value (this result is stored in CL1). After testing is completed, rinse cell immediately. Record the Total Chlorine as the highest value the meter displayed.

**MENU****Bromine DPD-1 Test Procedure****bR****bR2****1 REMOVE STRIP**

Remove one (1) **eXact® Strip Micro bR (DPD-1), Part No. 486636** from the bottle before beginning the test. Set the strip in a dry, convenient place and recap the bottle immediately.

**2 TURN METER ON**

Press the **ZERO/ON** button to power the meter on; the display will show all annunciators, then the current MENU selection, followed by the last reading.

**3 SELECT TEST: bR2**

Press and re-press the **MENU** button until the display shows the parameter **bR2**.

**4 FILL METER WITH SAMPLE**

Rinse the **CELL** at least 3 times with the water sample you will be testing - rinsing minimizes the potential for cross-contamination from a previous test. Finally, fill cell to capacity (4ml) with the water sample.

**5 ZERO METER\***

Press the **ZERO/ON** button. The cursor will move across the display, followed by **0.00 PPM**. The sample is ready for testing.

**6 DIP STRIP AND PRESS "READ"**

Dip the **eXact® Strip Micro bR (DPD-1), Part No. 486636** into the **CELL** and immediately press **READ**. This starts the **20 SECOND** countdown timer. During this time move the strip in a gentle back and forth motion (approx. 2 strokes/sec). **Remove and discard the strip after "1" on the display disappears\***. The cursor will move across the display while the meter prepares to measure the sample. Record result displayed (this result is stored in bR2 memory). After testing is completed, rinse cell immediately and press **MENU** to select next test.

\*NOTE: When testing outdoors (sunlight), for best accuracy, use the Mixing Cap/Cell Cover when Zeroing and Reading the sample.

**MENU****O3**

## Ozone Test Procedure

**O<sub>3</sub>****1 REMOVE STRIP**

Remove one (1) **eXact® Strip Micro O<sub>3</sub> (DPD-4), Part No. 486634** from the bottle before beginning the test. Set the strip in a dry, convenient place and recap the bottle immediately.

**2 TURN METER ON**

Press the **ZERO/ON** button to power the meter on; the display will show all annunciators, then the current MENU selection, followed by the last reading.

**3 SELECT TEST: O3**

Press and re-press the **MENU** button until the display shows the parameter **O3**.

**4 FILL METER WITH SAMPLE**

Rinse the **CELL** at least 3 times with the water sample you will be testing - rinsing minimizes the potential for cross-contamination from a previous test. Finally, fill cell to capacity (4ml) with the water sample.

**5 ZERO METER\***

Press the **ZERO/ON** button. The cursor will move across the display, followed by **0.00 PPM**. The sample is ready for testing.

**6 DIP STRIP AND PRESS "READ"**

Dip the **eXact® Strip Micro O<sub>3</sub> (DPD-4), Part No. 486634** into the **CELL** and immediately press **READ**. This starts the **20 SECOND** countdown timer. During this time move the strip in a gentle back and forth motion (approx 2 strokes/sec). **Remove and discard the strip after "1" on the display disappears\***. The cursor will move across the display while the meter prepares to measure the sample. Record result displayed (this result is automatically stored in O3).

**MENU****Cd4**

## Chlorine Dioxide Test Procedure

**Cd****1 REMOVE STRIP**

Remove one (1) **eXact® Strip Micro Cd (DPD-1), Part No. 486633** from the bottle before beginning the test. Set the strip in a dry, convenient place and recap the bottle immediately.

**2 TURN METER ON**

Press the **ZERO/ON** button to power the meter on; the display will show all annunciators, then the current MENU selection, followed by the last reading.

**3 SELECT TEST: Cd4**

Press and re-press the **MENU** button until the display shows the parameter **Cd4**.

**4 FILL METER WITH SAMPLE**

Rinse the **CELL** at least 3 times with the water sample you will be testing - rinsing minimizes the potential for cross-contamination from a previous test. Finally, fill cell to capacity (4ml) with the water sample.

**5 DIP STRIP AND PRESS "READ"**

Dip the **eXact Strip Micro Glycine, Part No. 484014** into the **CELL** and immediately press **READ**. This starts the **20 SECOND** countdown timer. During this time move the strip in a gentle back and forth motion (approx 2 strokes/sec). **Remove and discard the strip after "1" on the display disappears**. The cursor will move across the display, while the meter prepares to measure the sample (ignore this result).

**6 ZERO METER\***

Press the **ZERO/ON** button. The cursor will move across the display, followed by **0.00 PPM**.

**7 DIP STRIP AND PRESS "READ"**

Dip the **eXact® Strip Micro Cd (DPD-1), Part No. 486633** into the **CELL** and immediately press **READ**. This starts the **20 SECOND** countdown timer. During this time move the strip in a gentle back and forth motion (approx 2 strokes/sec). **Remove and discard the strip after "1" on the display disappears\***. The cursor will move across the display while the meter prepares to measure the sample. Record result displayed (this result is automatically stored in Cd4). After testing is completed, rinse cell immediately.

\*NOTE: When testing outdoors (sunlight), for best accuracy, use the Mixing Cap/Cell Cover when Zeroing and Reading the sample.

**MENU**

## Peracetic Acid Test Procedure

**PA****PA5**

### **1 REMOVE STRIP**

Remove one (1) **eXact® Strip Micro PA (DPD-4), Part No. 486674** from the bottle before beginning the test. Set the strip in a dry, convenient place and recap the bottle immediately.

### **2 TURN METER ON**

Press the **ZERO/ON** button to power the meter on; the display will show all annunciators, then the current MENU selection, followed by the last reading.

### **3 SELECT TEST: PA5**

Press and re-press the **MENU** button until the display shows the parameter **PA5**.

### **4 FILL METER WITH SAMPLE**

Rinse the **CELL** at least 3 times with the water sample you will be testing - rinsing minimizes the potential for cross-contamination from a previous test. Finally, fill cell to capacity (4ml) with the water sample.

### **5 ZERO METER**

Press the **ZERO/ON** button. The cursor will move across the display, followed by **0.00 PPM**. Sample is ready for testing.

### **6 DIP STRIP AND PRESS "READ"**

Dip the **eXact® Strip Micro PA (DPD-4), Part No. 486674** into the **CELL** and immediately press **READ**. This starts the **20 SECOND** countdown timer. During this time move the strip in a gentle back and forth motion (approx. 2 strokes/sec). **Remove and discard the strip after "1" on the display disappears**. The cursor will move across the display while the meter prepares to measure the sample. Record result displayed (this result is automatically stored in PA5). After testing, rinse cell immediately.

**MENU**

## Hydrogen Peroxide Test Procedure

**HP****HP6**

### **1 REMOVE STRIP**

Remove one (1) **eXact® Strip Micro HP, Part No. 486616** from the bottle before beginning the test. Set the strip in a dry, convenient place and recap the bottle immediately.

### **2 TURN METER ON**

Press the **ZERO/ON** button to power the meter on; the display will show all annunciators, then the current MENU selection, followed by the last reading.

### **3 SELECT TEST: HP6**

Press and re-press the **MENU** button until the display shows the parameter **HP6**.

### **4 FILL METER WITH SAMPLE**

Rinse the **CELL** at least 3 times with the water sample you will be testing - rinsing minimizes the potential for cross-contamination from a previous test. Finally, fill cell to capacity (4ml) with the water sample.

### **5 ZERO METER**

Press the **ZERO/ON** button. The cursor will move across the display, followed by **0.00 PPM**. The sample is ready for testing.

### **6 DIP STRIP - (read carefully and follow procedure closely)**

Dip the **eXact® Strip Micro HP, Part No. 486616** into the **CELL** and immediately press **READ**. This starts the **20 SECOND** countdown timer. During this time move the strip in a gentle back and forth motion (approx. 2 strokes/sec). **Remove and discard the strip after "1" on the display disappears**. The meter will begin counting up for **120 seconds**, at the end of which, the cursor will move across the display while the meter prepares to measure the sample. Record result displayed (this result is automatically stored in HP6). After testing is completed, rinse cell immediately.

\*NOTE: When testing outdoors (sunlight), for best accuracy, use the Mixing Cap/Cell Cover when Zeroing and Reading the sample.

**MENU**

## Standard Transmission Test Procedure

**TR****TR7**

This menu can be used for custom tests.

- 1 REMOVE STRIP**  
Remove one (1) **eXact® Strip Micro** (part number is dependent upon the test being run) from the bottle before beginning the test. Set the strip in a dry, convenient place and recap the bottle immediately.
- 2 TURN METER ON**  
Press the **ZERO/ON** button to power the meter on; the display will show all annunciators, then the current MENU selection, followed by the last reading.
- 3 SELECT TEST: TR7**  
Press and re-press the **MENU** button until the display shows the parameter **TR7**. Contact technical support in the USA at (803) 329-0162 (ext. 0) for details.
- 4 FILL METER WITH SAMPLE**  
Rinse the **CELL** at least 3 times with the water sample you will be testing - rinsing minimizes the potential for cross-contamination from a previous test. Finally, fill cell to capacity (4ml) with the water sample.
- 5 ZERO METER**  
Press the **ZERO/ON** button. The cursor will move across the display, followed by **100 %T**. The sample is ready for testing.
- 6 DIP STRIP AND PRESS "READ"**  
Dip the **eXact® Strip Micro (or add Reagent)** into the **CELL** immediately press **READ**. This starts the **20 SECOND** countdown timer. During this time move the strip in a gentle back and forth motion (approx. 2 strokes/sec). **Remove and discard the strip after "1" on the display disappears.** The cursor will move across the display while the meter prepares to measure the sample. Record result displayed (this result is automatically stored in TR7). After testing is completed, rinse cell immediately.

**MENU**

## High Range Free Chlorine Test Procedure

**HR****HR8**

NOTE: This test is good for all water temperatures (0°C - 40°C).

- 1 REMOVE STRIP**  
Remove one (1) **eXact® Strip Micro HR, Part No. 486672** from the bottle before beginning the test. Set the strip in a dry, convenient place and recap the bottle immediately.
- 2 TURN METER ON**  
Press the **ZERO/ON** button to power the meter on; the display will show all annunciators, then the current MENU selection, followed by the last reading.
- 3 SELECT TEST: HR8**  
Press and re-press the **MENU** button until the display shows the parameter **HR8**.
- 4 FILL METER WITH SAMPLE**  
Rinse the **CELL** at least 3 times with the water sample you will be testing - rinsing minimizes the potential for cross-contamination from a previous test. Finally, fill cell to capacity (4ml) with the water sample.
- 5 ZERO METER**  
Press the **ZERO/ON** button. The cursor will move across the display, followed by **0.00 PPM**. The sample is ready for testing.
- 6 DIP STRIP - (read carefully and follow procedure closely)**  
Dip the **eXact® Strip Micro HR, Part No. 486672** into the **CELL** and immediately press **READ**. This starts the **20 SECOND** countdown timer. During this time move the strip in a gentle back and forth motion (approx. 2 strokes/sec). **Remove and discard the strip after "1" on the display disappears.** The meter will begin counting up for **120 seconds**, at the end of which, the cursor will move across the display while the meter prepares to measure the sample. Record result displayed (this result is automatically stored in HR8). After testing is completed, rinse cell immediately.  
*\*NOTE: Use a 10 second dip time if water temperature is above 45°C.*

\*NOTE: When testing outdoors (sunlight), for best accuracy, use the Mixing Cap/Cell Cover when Zeroing and Reading the sample.

## eXact® Chlorine Plus Tips For Best Accuracy

1. Become familiar with the meter and the different tests by reading the instructions carefully.
2. The Free Chlorine, Combined Chlorine, and Total Chlorine reagents are compliant for meeting USEPA (4500-Cl G); ISO 7393/2; and German DIN 38408 G4-2 requirements.
3. Observe the dip time (*as required for the test*) for accurate results.
4. Test immediately after filling the **CELL** with water sample when testing for oxidizers.
5. Be sure the **CELL** is filled to capacity (4ml).
6. Rinse the **CELL** with clean water immediately after completing the test. (*DPD will stain the CELL wall if allowed to remain in the CELL*)
7. Just before testing, rinse the sample **CELL** with the sample water several times to get a representative sample. (*Use deionized or distilled water for rinsing if you have a limited amount of sample*).
8. Store the meter and all test materials out of direct sunlight and away from chemical storage areas.
9. Minimize exposure of meter and test reagents to heat above 32°C (90°F).
10. Dry the outside of the meter when testing is complete or before storage of the meter.
11. When running a DPD-1 Free Chlorine test **AFTER** a Total Chlorine DPD-3, a Total Chlorine DPD-4, or a HR Free Chlorine test, rinsing is very important to remove residual KI, which may interfere.
12. Each eXact® Strip Micro is valid for **ONLY** one test. Discard strip after single use in regular refuse that is inaccessible to children and pets.
13. Each bottle of eXact® Strip Micro contains, at minimum, the quantity of strips notated on the bottle. Due to the strip slitting process, you may find one or two extra strips that are noticeably smaller or larger in width than the normal strips in the bottle. These should be discarded. Using these strips may give incorrect results.
14. The eXact® Chlorine Plus Meter is not compatible for use with DPD-1, DPD-3, and DPD-4 powder pillows, tablets, or liquids available from other manufacturers. Accurate results can only be guaranteed by using genuine eXact® Micro strips or reagents (*reorder information below*).
15. Our lab testing with the Chlorine Plus meter has shown that zeroing and measuring of the sample normally does not require any cell cover for accurate results, except in sunlight. To obtain optimal accuracy when testing with the meter outdoors (sunlight), use the Mixing Cap/Cell Cover when zeroing and reading the sample.
16. Remove batteries when meter is not used for more than a month (Warranty Requirement).

## eXact® Strip Chlorine Plus Reagent Reorder Information

**eXact® Strip Micro (4mL ) Reagent Specifications - For use with eXact® Chlorine Plus, Part no. 486696-PLUS**

No.	PARAMETER	PART NO.	# OF TESTS	DETECTION RANGE	CHEMISTRY
	eXact® Micro Carrying Case w/ foam	486001	N/A	N/A	N/A
	Mini Dilution Kit II	487202	N/A	N/A	N/A
	2.0 ppm Reference Standard	486602-II	15	N/A	N/A
1	Bromine (DPD-1)	486636	100	0 - 14 ppm	DPD
2	Chlorine Dioxide (DPD-1)	486633	100	0 - 12 ppm	DPD
3	Free Chlorine (DPD-1)	486637	100	0 - 11 ppm	DPD
4	Total Chlorine (DPD-3)	486638	100	0 - 11 ppm	DPD
5	HR Free Chlorine	486672	50	0 - 300 ppm	KI + Buffer
6	Hydrogen Peroxide LR	486616	50	0 - 3 ppm	DPD + PO <sub>4</sub> + MoO <sub>4</sub> + KI
7	Ozone (DPD-4)	486634	100	0 - 9 ppm	DPD + KI
8	Peracetic Acid (PAA) (DPD-4)	486674	100	0 - 9 ppm	DPD + KI
9	Glycine (used for Chlorine Dioxide)	484014	50	N/A	Glycine


NOTE: Because most of our products are test strips or use reagents that have little or no hazard in the quantity sold, MSDS sheets are not supplied with the test kit.

**If your required procedure is not listed in this manual, please see the back page for our contact information.**

**To ensure optimal performance, store your eXact® kit in a cool, dry place away from excess heat (below 90°F / 32°C), moisture, and oxidizers such as Chlorine and Bromine.**

## eXact® Chlorine Plus Meter Messages

The following are some common messages that may be displayed, including error messages. If an error message other than those listed below is displayed, please contact technical support in the USA at (803) 329-0162 (ext. 0).

LCD Message	Description	Corrective Action
HI	In READ mode: test sample concentration is above the measurement range (test specific).	Dilute and retest. Dilution Kit available (Part Number 487200).
LO	In READ mode: test sample concentration is below the measurement range (test specific).	Sample value is below measurement range.
LO	In ZERO mode: sample absorbance (due to a cloudy or colored sample or a dirty cell) is too high to zero, the meter will read "LO".	Dilute sample, filter sample, or clean cell. One of these options should remedy the problem.
ER	Excessive stray light detected. Normally this does not occur, even when testing in sunlight.	Place the LIGHT BLOCKING CAP over the CELL for zeroing and for reading result. Moving to a shaded area can also fix this problem.
	Low battery indication.	Replace the batteries.

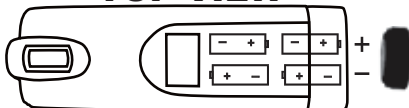
## About The Built-In Cell

The built-in **CELL** is transparent plastic and, when filled to the top, contains 4ml. The sturdy **CELL** design will last for over 20,000 readings. Scratches on the **CELL** will not interfere or compromise the accuracy of the readings because of its fixed position. For best accuracy, rinse cell with clean water immediately after a test is completed. Do not use solvents, such as acetone, to clean the cell. When the **CELL** becomes stained or cloudy from repeated testing, or when the meter does not blank when you press the **ZERO/ON** button, the cell needs to be cleaned. **Clean as follows:** Fill cell with clean water and move the **Cell cleaning brush** up-and-down and back-and-forth along the walls of the cell. Afterwards, rinse the cell and the meter is ready for use again. Cleaning the cell regularly is especially recommended after you run a test that is using turbidity or precipitation chemistry for analysis (contact technical support for details).

## To Install/Replace "AAA" Batteries:

1. Unscrew the O-ring sealed battery cover counter-clockwise. Use proper sized pliers if necessary. Do not disturb the sealing O-ring. Batteries are not included.
2. Remove the used batteries and install 4 new AAA batteries following the diagram for correct polarity (see diagram). We recommend high quality AAA alkaline batteries be used.
4. Replace the battery cover. Be sure to tighten the cover securely. Do not over tighten. This is necessary for meter to be waterproof.
5. Dispose of the used batteries in accordance with your local regulations.
6. Press ZERO/ON button to confirm the meter turns on.  
The meter is now ready for operation.
7. Meter will not work if battery orientation is incorrect.

### TOP VIEW



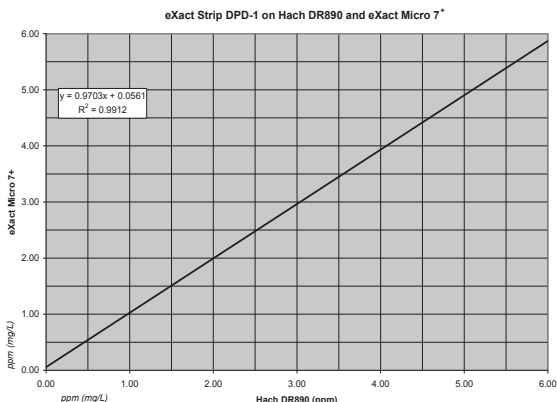
## eXact® Photometer 2-Year Limited Warranty

Registration of your eXact® photometer must be received within 30 days from date of purchase to activate the warranty. The eXact® photometer is warranted to be free from defects in materials and workmanship for a period of two (2) years from the date of purchase by the customer. ITS will repair or replace any part of the product which is deemed to be faulty or otherwise defective. The non-transferable warranty does not cover product damage caused by abuse (such as crushing a tablet in the cell) or improper use. If the meter is faulty or otherwise defective contact ITS by phone (+1-803-329-9712 Ext. 0) or email (its@sensafe.com) to describe the problem and obtain a return authorization form before returning the photometer to ITS. Damage caused by improper packing of the photometer for return shipment to ITS will not be covered by the warranty. Customer is responsible for shipping charges to ITS. ITS pays postage when photometer is returned to customer. A maximum processing fee of \$75 will be charged for repair or replacement of non-registered photometers and damages not covered by this warranty. Registration is available over the phone (+1-803-329-9712 Ext. 0) or online at <http://www.sensafe.com/micro/warranty/> (Personal data is kept confidential)

# eXact® Strip Micro DPD-1 Accuracy

Free Chlorine results are compared using the **eXact® Strip Micro CL (DPD-1)** with the eXact® Chlorine Plus Meter in Menu CL1 and Hach® DR890 Colorimeter in Program 9 and Program 12 using Hach® powder pillows.

DR890	Chlorine Plus
0.00	0.00
0.41	0.39
0.92	0.96
0.79	0.73
1.28	1.32
2.70	2.73
3.20	3.22
4.45	4.75
5.30	5.53



Meter	Menu	Range (PPM)	Resolution
Chlorine Plus	CL1	0.00 to 5.99	0.01
		6.0 to 11.0	0.1
DR890	Program 9	0.00 to 2.20	0.01
	Program 12	0.0 to 11.0	0.1

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## The eXact® Chlorine Plus Kit

(486696-PLUSK)

### Kit Includes:

- 1 eXact® Chlorine Plus Meter (486696-PLUS)
- 25 tests of eXact® Strip Micro CL (DPD-1) (486637-25)
- 25 tests of eXact® Strip Micro bR (DPD-1) (486636-25)
- 25 tests of eXact® Strip Micro O<sub>3</sub> (DPD-4) (486634-25)
- 25 tests of eXact® Strip Micro Cd (DPD-1) (486633-25)
- 25 tests of eXact® Strip Micro PA (DPD-4) (486674-25)
- 25 tests of eXact® Strip Micro HP (486616-25)
- 50 tests of eXact® Strip Micro Glycine (484014)
- 25 tests of eXact® Strip Micro HR (486672-25)
- Mini Dilution Kit II (487202)
- 1 Mixing Cap
- 1 Cell Cleaning Brush
- This Instruction Booklet
- Plastic Carrying Case

## Contact Information

### For US Inquiries and Re-Orders:

#### Industrial Test Systems, Inc.

1875 Langston Street,  
Rock Hill, SC 29730 USA

Phone: 1-800-861-9712 - *INSIDE THE U.S.*

1-803-329-9712 - *OUTSIDE THE U.S.*

Fax: 1-803-329-9743

**ITS@SENSAFE.COM**

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### For European & Middle East Inquiries and Re-Orders:

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