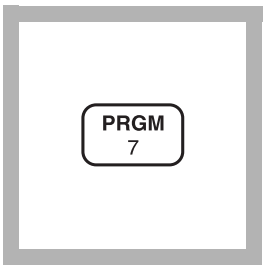
ALUMINUM (0 to 0.80 mg/L)

Aluminon Method*



1. 알루미늄을 측정하기 위해서 프로그램 번호를 선택한다.

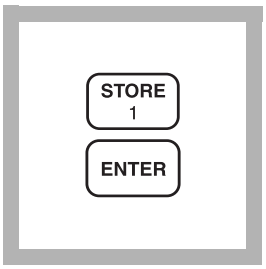
PRGM키를 누른다.

화면에 PRGM ?

이 표시된다.

Note: *Adjust the pH of stored samples before analysis.*

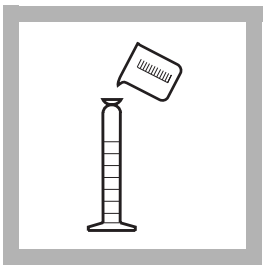
Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*



2. 1번을 선택하고 ENTER키를 누른다. 화면에 **mg/L, Al**과 **ZERO** 아이콘 표시**.**

Note: *Total aluminum determination requires a digestion prior to analysis (see Section 2).*

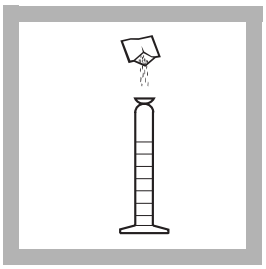
Note: *For alternate form (Al_2O_3), press* **CONC**.



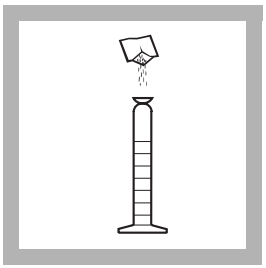
3. 눈금실린더에 샘플을 50mL 채운다.

Note: *Rinse cylinder with 1:1 Hydrochloric Acid and deionized water before use to avoid errors due to contaminants absorbed on the glass.*

Note: *Sample temperature must be 20-25 °C (68-77 °F) for accurate results.*



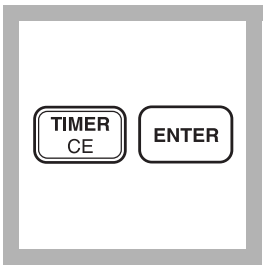
4. Ascorbic Acid Powder Pillow 를 하나 넣고 마개를 닿는다. 수차례 뒤집어서 파우더를 용해시킨다.



5. 용해시킨 샘플에 AluVer® 3 Aluminum Reagent Powder Pillow 를 넣고 마개를 닫는다.

Note: *A red-orange color develops if aluminum is present.*

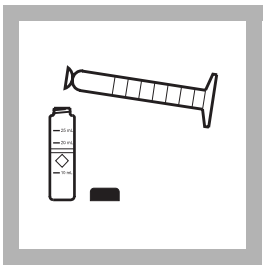
Note: *Inconsistent results will occur if any powder is undissolved.*



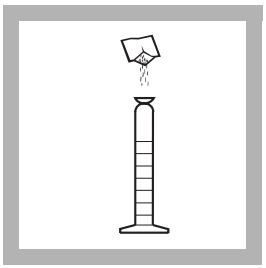
6. 다음 버튼을 누른다:

TIMER ENTER

3분간의 반응 시간이 표시된다. 3분간 반복해서 실린더를 뒤집어 섞어준다.



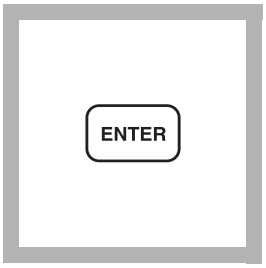
7. 혼합물을 25mL 샘플셀에 옮겨담는다. (the prepared sample).



8. 남은 혼합물에 Bleaching 3 Reagent Powder Pillow를 넣고 마게를 닿는다. (the blank).

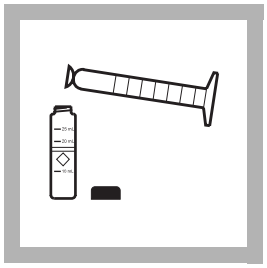
---

* Adapted from *Standard Methods for the Examination of Water and Wastewater*

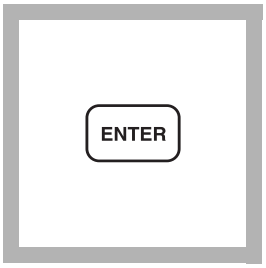


9. 화면에
00:30 Timer 2가 표시.
ENTER키를 누른다.
30초간 반응시간이 표시된다.
30초간 실린더를 매우 강하게 흔들어준다.

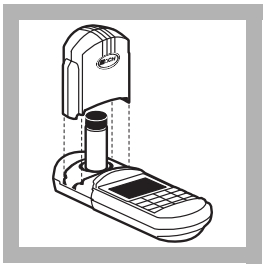
Note: *This solution should turn a light to medium orange upon bleaching. It will not become colorless.*



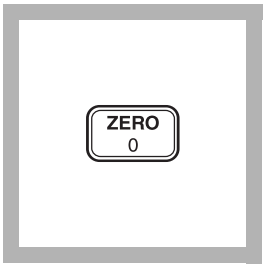
10. 만들어진 혼합물을 다른 25mL 샘플셀에 옮겨 담는다. (the blank)



11. 화면에
15:00 TIMER3이 표시.
ENTER키를 누른다.
15분간 반응시간이 표시된다.

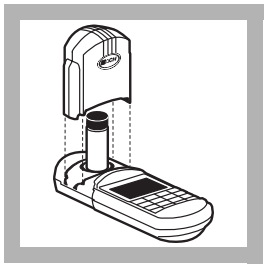


12. 타이머가 울린 후 3분안에 blank를 셀 홀더에 넣고, 기기 뚜껑으로 샘플셀을 덮어준다.

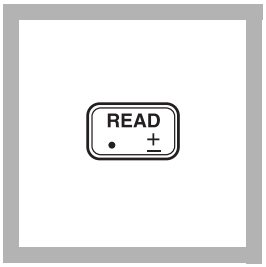


13. ZERO키를 누른다.
화면에 0.000mg/L Al 이 표시된다.

Note: *If Reagent Blank Correction is on, the display may flash "limit". See Section 1.*



14. 즉시 측정할 샘플을 셀 홀더에 넣고, 기기 뚜껑으로 샘플 셀을 덮어준다.



15. READ키를 누른다.
화면에 결과치가 mg/L aluminum 로 표시된다.

Note: *Clean the graduated cylinder and sample cells with soap and brush immediately following the test.*

Note: *Standard Adjust may be performed using a prepared standard (see Section 1).*

REQUIRED REAGENTS

	Cat. No.
Aluminum Reagent Set (100 Tests)	22420-00

Includes: (1) 14290-99, (1) 14577-99, (1) 14294-49

Description	Quantity Required Per Test	Unit	Cat. No.
AluVer 3 Aluminum Reagent Powder Pillow	1 pillow	100/pkg	14290-99
Ascorbic Acid Powder Pillow	1 pillow	100/pkg	14577-99
Bleaching 3 Reagent Powder Pillow	1 pillow	100/pkg	14294-49

REQUIRED APPARATUS

Cylinders, graduated mixing, 50 mL	1	each	1896-41
Sample Cell, 10-20-25 mL, w/ cap	2	6/pkg	24019-06

OPTIONAL REAGENTS

Aluminum Standard Solution, 100 mg/L	100 mL	14174-42
Aluminum Standard Solution, Voluette ampule, 50 mg/L as Al, 10 mL	16/pkg	14792-10
Hydrochloric Acid Solution, 6N (1:1)	500 mL	884-49
m-Nitrophenol Indicator Solution, 10 g/L	100 mL	2476-32
Nitric Acid, ACS	500 mL	152-49
Nitric Acid Solution, 1:1	500 mL	2540-49
Sodium Hydroxide Standard Solution, 5.0 N	100 mL MDB	2450-32
Sodium Hydroxide Standard Solution, 5.0 N	50 mL SCDB	2450-26
Sulfuric Acid Standard Solution, 5.25 N	100 mL MDB	2449-32
Water, deionized	4 L	272-56

OPTIONAL APPARATUS

Ampule Breaker Kit	each	21968-00
Brush	each	690-00
Flask, volumetric, Class A, 100 mL	each	14574-42
Flask, volumetric, Class A, 250 mL	each	14574-46
Fluoride Combination Electrode	each	51928-00
Fluoride ISA Powder Pillows	25/pkg	2589-99
pH Indicator Paper, 1 to 11 pH	5 rolls/pkg	391-33
pH/ISE Meter, *sension*™*2*, portable	each	51725-00
Pipet, TenSette, 0.1 to 1.0 mL	each	19700-01
Pipet Tips, for 19700-01 TenSette Pipet	50/pkg	21856-96
Pipet Tips, for 19700-01 TenSette Pipet	1000/pkg	21856-28
Pipet, Volumetric, Class A, 1.00 mL	each	14515-35
Thermometer, –20 to 110 °C, non-mercury	each	26357-02

For Technical Assistance, Price and Ordering

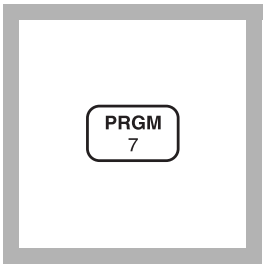
In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

BENZOTRIAZOLE (0 to16.0 mg/L) or TOLYLTRIAZOLE (0 to 16.0 mg/L)

UV Photolysis Method*

For cooling or boiler water

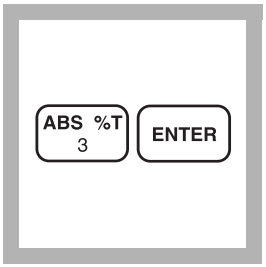


1. benzotriazole 또는 tolyltriazole을 측정하기 위해서 프로그램 번호를 선택한다 .

PRGM키를 누른다.

화면에 PRGM?이 표시

Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*

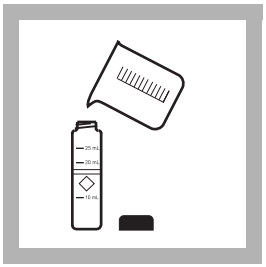


2. 3번을 선택하고 ENTER.

화면에 mg/L, BENZO 또는, mg/L, TOLY가 표시되고 ZERO

아이콘이 표시된다.

CONC키를 눌러서 측정하고자 하는 **triazole**을 선택한다.



3. 샘플 셀에 샘플을 25mL 따른다.

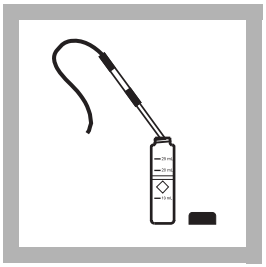
Note: *Sample temperature should be between 20-25 °C (68-77 °F).*

Note: *If sample contains nitrite or borax (sodium borate), adjust the pH to between 4 and 6 with 1 N sulfuric acid.*

4. Triazole Reagent Powder Pillow를 하나 넣고 흔들어서 완전히 용해 시킨다.

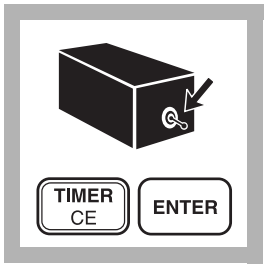
Note: *If the sample contains more than 500 mg/L hardness (as $CaCO_3$), add 10 drops of Rochelle Salt Solution.*

* Adapted from Harp, D., Proceedings 45th International Water Conference, 299 (October 22-24, 1984)



5. 샘플 셀에 자외선 램프를 넣는다.

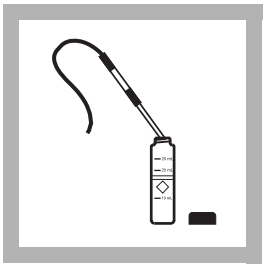
Note: *UV safety goggles should be worn while the lamp is on.*



6. 자외선 램프를 켜고 TIMER ENTER 입력.

5분간 반응시간이 표시된다.

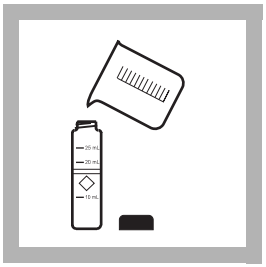
Note: *A yellow color will form if triazole is present.*



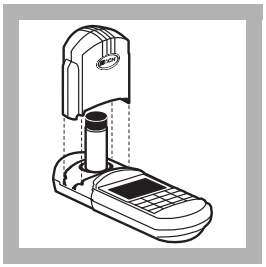
7. 타이머가 울리면 자외선 램프를 끄고 셀에서 꺼낸다. (the prepared sample). 셀을 휘저어서 완전히 섞어 주도록 한다.

Note: *Low results will occur if photolysis (lamp ON) takes place for more or less than five minutes.*

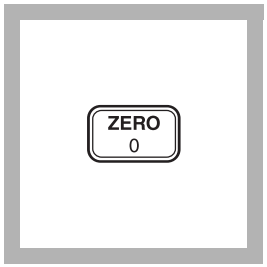
Note: *Avoid handling the quartz surface of the lamp. Rinse the lamp and wipe with a soft, clean tissue between tests.*



8. 다른 샘플 셀에 샘플 25mL를 따른다. (the blank).



9. blank를 셀 홀더에 끼우고 기기 덮개를 덮어준다.



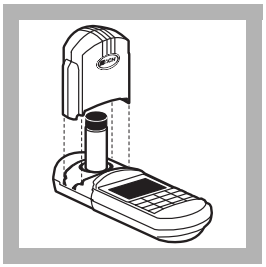
10. **ZERO**키를 누른다. 화면에 다음과 같이 표시된다 :

0.0 mg/L Benzo

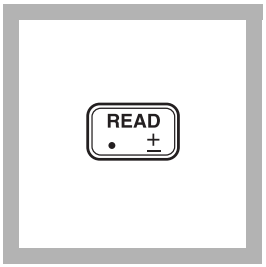
또는,

0.0 mg/L Toly

Note: *If Reagent Blank Correction is on, the display may flash "limit". See Section 1.*



11. 측정할 샘플을 셀 홀더에 넣고 기기 덮개를 덮어준다.



12. **READ**키를 누른다. 화면에 결과치가 mg/L benzotriazole 또는 mg/L tolyltriazole 로 표시된다.

Note: *Standard Adjust may be performed using a prepared standard (see Standard Adjust in Section 1).*

REQUIRED REAGENTS

Description	Quantity Required Per Test	Unit	Cat. No.
Triazole Reagent Powder Pillows	1 pillow	100/pkg	21412-99

REQUIRED APPARATUS

Sample Cell, 10-20-25 mL, w/cap	2	6/pkg	24019-06
Select one based on available voltage:			
Lamp, UV, with power supply, 115 V, 60 Hz, with goggles	1	each	20828-00
Lamp, UV, with power supply, 230 V, 50 Hz, with goggles	1	each	20828-02

OPTIONAL REAGENTS

Benzotriazole Standard Solution, 500 mg/L		100 mL	21413-42
Rochelle Salt Solution		29 mL* DB	1725-33
Sulfuric Acid Standard Solution, 1.00 N		100 mL MDB	1270-32
Water, deionized		4 L	272-56

OPTIONAL APPARATUS

Flask, volumetric, Class A, 1000 mL		each	14574-53
Lamp, UV (lamp only)		each	26710-00
pH Paper, 1 to 11 pH		5 rolls/pkg	391-33
pH Meter, *sension*™*1*, portable with electrode		each	51700-10
Pipet Filler, safety bulb		each	14651-00
Pipet, TenSette, 0.1 to 1.0 mL		each	19700-01
Pipet Tips, for 19700-01 TenSette Pipet		50/pkg	21856-96
Pipet Tips, for 19700-01 TenSette Pipet		1000/pkg	21856-28
Pipet, volumetric, 10.0 mL, Class A		each	14515-38
Safety Goggles, UV		each	21134-00
Stopwatch		each	14645-00
Thermometer, –20 to 110 °C, non-mercury		each	26357-02
Timer, interval, 1 second to 99 hours		each	23480-00

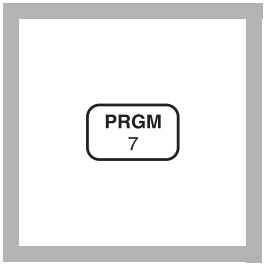
For Technical Assistance, Price and Ordering

In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

* Contact Hach for larger sizes.

Azomethine-H Method*

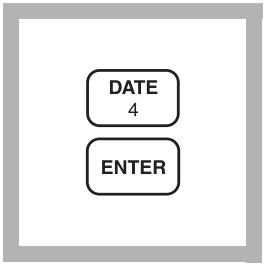


1. 보론 LR 측정을 위해 프로그램 번호를 선택한다.

Press: **PRGM**

The display will show:

PRGM ?



2. **4**번을 선택하고 ENTER. 화면에 **mg/L, B** 와 ZERO 아이콘이 표시된다**.**

Note: *For alternate form (H_3BO_3), press the* **CONC** *key.*

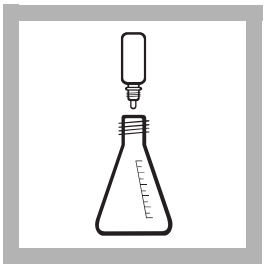
3. 깨끗한 erlenmeyer 플라스크에 초순수 25mL를 채운다. (the blank).

Note: *For most accurate work, perform a blank analysis with each sample analysis.*

4. 다른 erlenmeyer 플라스크에 샘플을 25mL 채운다.

Note: *If the sample is highly colored, turbid, or contains interferences, see* Interferences *section for sample pretreatment.*

Note: *Sample temperature should be between 22-24 °C (72-75 °F). If outside this range, measure and record the sample temperature; see* Sample Temperature Compensation, *below.*

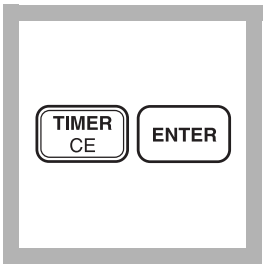


5. 1 M EDTA Solution 10방울씩을 각 플라스크에 떨어뜨리고 휘저어 섞어준다.

6. one BoroTrace 2 Reagent pillow를 샘플이 들어있는 플라스크에 넣어준다.

7. 즉시 마개를 덮고 강하게 흔들어서 시약을 용해시킨다.

Note: *Proceed with Steps 8 and 9 immediately.*



8. TIMER ENTER 입력

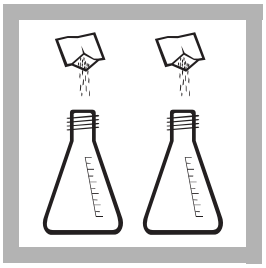
10분간 반응시간이 표시된다.

* Adapted from ISO Method 9390; Adapted from Harp, D. L., *Analytica Chimica Acta*, 346 (1997), 373–379

9. 계속해서 30초간 강하게 휘저어 준다. 반응시간이 지속되는 동안 덮개를 덮어 두도록 한다.

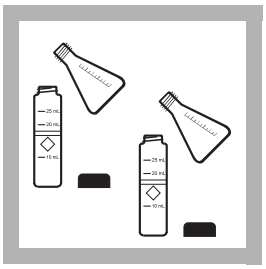
10. 반응시간 동안에 second BoroTrace 2 Reagent pillow를 blank에 넣어준다.

11. blank 플라스크를 파우더가 용해될 때까지 강하게 흔들어서 섞어준다.



12. 타이머가 울리면 one BoroTrace 3 Reagent pillow를 각 플라스크에 넣고, 마개를 닫은 후 흔들어서 용해 시킨다.

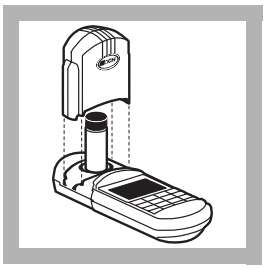
Note: *The addition of BoroTrace 3 Reagent "stops" the reaction.*



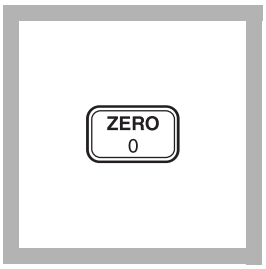
13. 각 플라스크의 내용물을 서로 다른 깨끗한 샘플 셀로 옮겨 담은 후 구분지어 놓는다.

14. 샘플 셀을 깨끗이 닦는다.

Note: *Wiping with a damp towel, followed by a dry one, will remove fingerprints or other marks.*



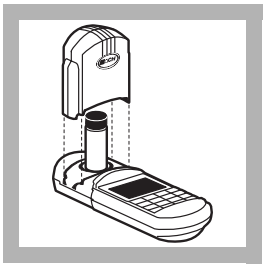
15. blank셀을 셀 홀더에 끼우고 기기 덮개를 덮어준다.



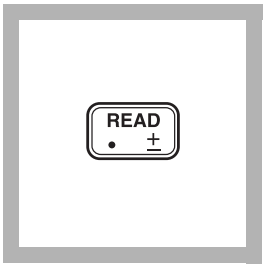
16. **ZERO**키를 누른다.

화면에 다음과 같이 표시된다:

0.00 mg/L B



17. 측정할 샘플을 셀 홀더에 넣고 기기 덮개를 덮어준다.



18. **READ**키를 누른다. 결과치가 mg/L boron 으로 표시된다.

Note: *Correct the result for sample temperature. If outside 22-24 °C (72-75 °F) see Sample Temperature Compensation section.*

Note: *Standard Adjust may be performed using a prepared standard (see Section 1).*

REQUIRED REAGENTS

Description	Cat. No.
BoroTrace Reagent Set	26669-00
Includes: (1) 26666-69, (1) 26667-99, (1) 22419-26, (1) 25946-49	

Description	Quantity Required Per Test	Unit	Cat. No.
BoroTrace 2 Reagent Pillows	2	100/pkg	26666-69
BoroTrace 3 Reagent Pillows	2	100/pkg	26667-99
EDTA Solution, 1 M	20 drops	50 mL SCDB	22419-26
Water, Ultra-Pure Aldehyde-Free	25 mL	500 mL	25946-49

REQUIRED APPARATUS

Clippers, for opening powder pillows	1	each	968-00
Flask, eErlenmeyer, poly, 125-mL, w/cap	2	each	20898-43
Sample Cell, 10-20-25 mL, w/cap	2	6/pkg	24019-06

OPTIONAL REAGENTS

Boron Standard Solution, 250 mg/L as B, 10-mL Voluette Ampule	16/pkg	14249-10
Boron Standard Solution, 1000 mg/L as B	100 mL	1914-42
Dechlorinating Reagent Powder Pillows	100/pkg	14363-69
Eluant Solution	1 L	22256-53
Phosphate Buffer Solution, pH 7.2	1 L	431-53
Sodium Hydroxide Standard Solution, 5.0 N	50 mL DB	2450-26
Sulfamic Acid	113 g	2344-14
Sulfuric Acid Standard Solution, 1.000 N	100 mL MDB	1270-32
Water, deionized	4 L	272-56

OPTIONAL APPARATUS

Description	Quantity Required Per Test	Unit	Cat. No.
Ampule Breaker Kit (for 10-mL ampules)		each	21968-00
Filter Holder Assembly		each	2468-00
Flask, volumetric, polypropylene, 100 mL, w/cap		each	14060-42
Flask, volumetric, polypropylene, 1000 mL, w/cap		each	14060-53
Membrane Filters, 3-micron		25/pkg	25940-25
pH Paper, pH 1-11		each	391-33
Pipet, Mohr-type, polypropylene, 5 mL		each	2106-37
Pipet, TenSette, 0.1 to 1.0 mL		each	19700-01
Pipet Tips, for 19700-01 TenSette Pipet		50/pkg	21856-96
Pipet Tips, for 19700-01 TenSette Pipet		1000/pkg	21856-28
Spoon, measuring, 0.1 g		each	511-00
Syringe, 30-cc		each	22258-00
Thermometer, –20 to 110 °C, non-mercury		each	26357-02

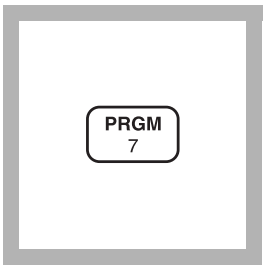
For Technical Assistance, Price and Ordering

In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

DPD Method* (Powder Pillows or AccuVac Ampuls)

Using Powder Pillows



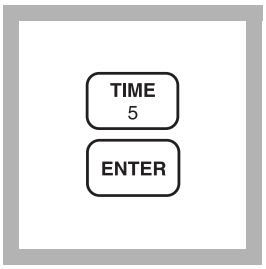
1. bromine (Br2)파우더 방식측정을 위해 번호를 선택한다.

Press: **PRGM**

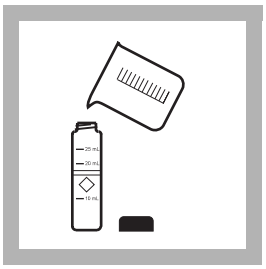
The display will show:

PRGM ?

Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*

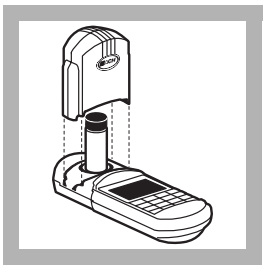


2. **5**번을 선택하고 ENTER입력. 화면에 **mg/L, Br2**와 ZERO 아이콘이 표시된다**.**



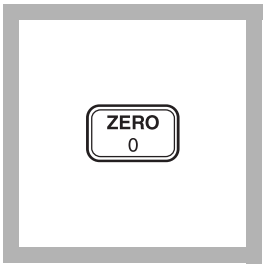
3. 샘플 셀에 샘플을 10mL 채운다. (the blank).

Note: *Samples must be analyzed immediately and cannot be preserved for later analysis.*



4. blank를 셀 홀더에 넣고 기기 덮개를 덮어준다.

* Adapted from *Standard Methods for the Examination of Water and Wastewater*



5. **ZERO**키를 누른다.

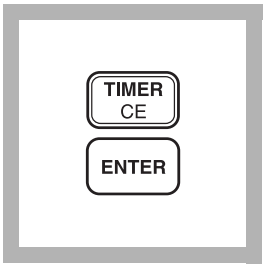
화면에 다음과 같이 표시된다:

0.00 mg/L Br2

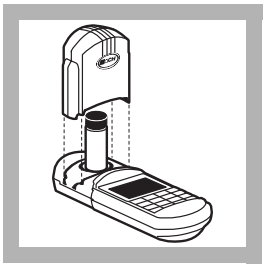
Note: *If Reagent Blank Correction is on, the display may flash "limit". See Section 1.*

6. DPD Total Chlorine Powder Pillow를 샘플 셀에 넣어준다. (the prepared sample). 마개를 닫고 강하게 흔들어서 시약을 용해 시킨다.

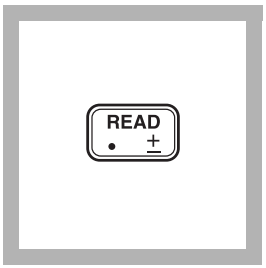
Note: *It is not necessary that all the powder dissolves. A pink color will develop if bromine is present.*



7. **TIMER ENTER**를 입력한다. 3분간 반응 시간이 표시된다.



8. 타이머가 울리면 샘플 셀을 셀 홀더에 넣고 기기 덮개를 덮어 준다.



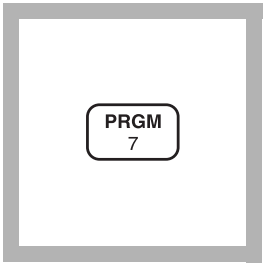
9. **READ**키를 누른다.

화면에 결과치가 mg/L bromine으로 표시된다.

Note: *If samples temporarily turn yellow after reagent addition, or the display flashes "limit", it is due to high bromine levels. Dilute fresh samples and repeat the test. A slight loss of bromine may occur during dilution. Multiply results by the dilution factor; see Section 1.*

Note: *Standard Adjust may be performed using a prepared standard (see Section 1).*

Using AccuVac Ampuls



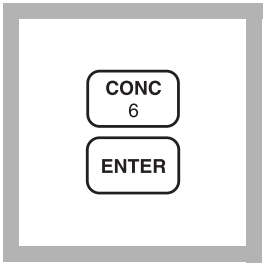
1. bromine (Br2) AccuVac Ampuls방식 측정을 위해 번호를 선택한다.

Press: **PRGM**

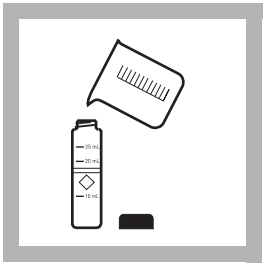
The display will show:

PRGM ?

Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*

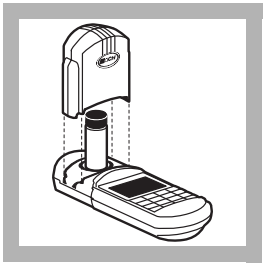


2. 6번을 선택하고 ENTER입력. 화면에 **mg/L, Br2** 와 **ZERO** 아이콘이 표시된다**.**

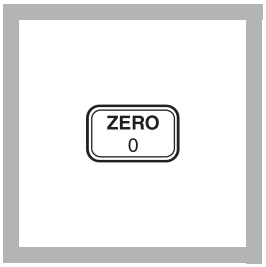


3. 샘플 셀에 샘플을 10mL이상 채운다. (the blank). 그리고 최소 40mL 이상의 샘플을 50mL 비커에 채운다.

Note: *Samples must be analyzed immediately and cannot be preserved for later analysis.*



4. blank를 셀 홀더에 끼우고 기기 덮개를 덮어준다.

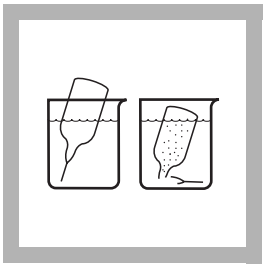


5. ZERO키를 누른다.

화면에 다음과 같이 표시된다:

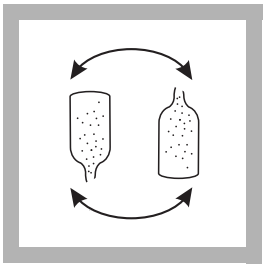
0.00 mg/L Br2

Note: *If Reagent Blank Correction is on, the display may flash "limit". See Section 1.*



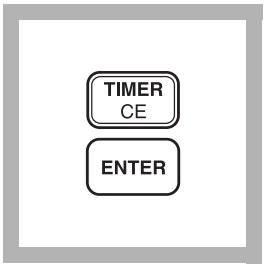
6. DPD Total Chlorine Reagent AccuVac Ampul에 샘플을 채운다.

Note: *Keep the tip immersed while the ampul fills completely.*



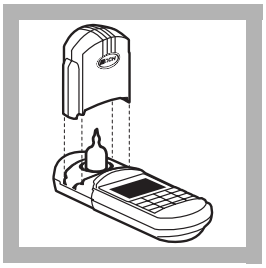
7. Ampule을 빠르게 여러번 뒤집어서 섞어 준 후에 표면을 깨끗이 닦아준다.

Note: *A pink color will form if bromine is present.*

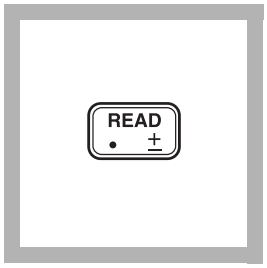


8. TIMER ENTER 입력

3분간 반응 시간이 표시된다.



9. 타이머가 울린 후, AccuVac ampul을 셀 홀더에 끼우고 기기 덮개를 덮어준다.



10. READ키를 누른다.

결과치가 mg/L bromine 으로 나타난다.

Note: *If the sample temporarily turns yellow after reagent addition, or the display flashes "limit", it is due to high bromine levels. Dilute a fresh sample and repeat the test. A slight loss of bromine may occur during dilution. Multiply the result by the dilution factor; see Section 1.*

Note: *Standard Adjust may be performed using a prepared standard (see Section 1).*

REQUIRED REAGENTS (USING POWDER PILLOWS)

Description	Quantity Required Per Test	Unit	Cat. No.
DPD Total Chlorine Reagent Powder Pillows	1 pillow	100/pkg	21056-69

REQUIRED REAGENTS (USING ACCUVAC AMPULS)

DPD Total Chlorine Reagent AccuVac Ampuls	1 ampule	25/pkg	25030-25

REQUIRED APPARATUS (USING POWDER PILLOWS)

Sample Cells, 10-20-25-mL, w/ cap		6/pkg	24019-06

REQUIRED APPARATUS (USING ACCUVAC AMPULS)

Beaker, 50 mL	1	each	500-41

OPTIONAL REAGENTS

Chlorine Standard Solution, PourRite ampule, 25-30 mg/L, 2 mL		20/pkg	26300-20
DPD Total Chlorine Reagent, SwifTest		250 Tests	28024-00
Potassium Iodide Solution, 30 g/L	100 mL*	MDB	343-32
Sodium Arsenite, 5 g/L	100 mL*	MDB	1047-32
Sodium Hydroxide Standard Solution, 1.000 N	100 mL*	MDB	1045-32
Sulfuric Acid Standard Solution, 1 N	100 mL*	MDB	1270-32
Water, deionized	4 L		272-56

OPTIONAL APPARATUS

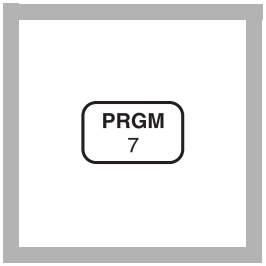
AccuVac Snapper Kit		each	24052-00
PourRite Ampule Breaker		each	24846-00
Cylinder, graduated, 25 mL		each	508-40
pH Meter, *sension*™*1*, portable		each	51700-00
pH Indicator Paper, 1 to 11 pH units		5 rolls/pkg	391-33
Pipet, TenSette, 0.1 to 1.0 mL		each	19700-01
Pipet Tips, for 19700-01 TenSette Pipet		50/pkg	21856-96
Pipet Tips, for 19700-01 TenSette Pipet		1000/pkg	21856-28

For Technical Assistance, Price and Ordering

In the U.S.A.—Call 800-227-4224

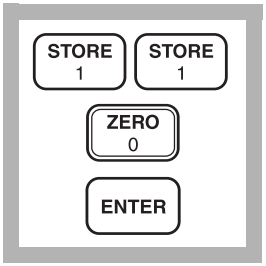
Outside the U.S.A.—Contact the Hach office or distributor serving you.

Indophenol Method* **For chlorinated drinking water and chlorinated wastewater**



1. monochloramine 측정을 위해서 프로그램 번호를 선택한다.

Press: **PRGM**
The display will show:
PRGM?



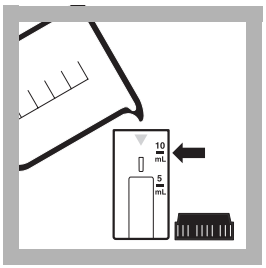
2. 110번을 누르고 **ENTER**

화면에 다음과 같이 표시

mg/L Cl_2

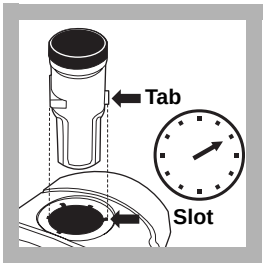
then: **ZERO**

Note: *For alternate forms, press the* **CONC** *key.*



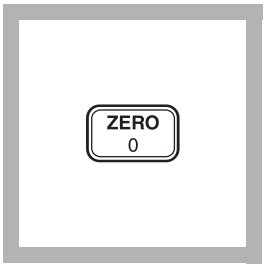
3. 10mL/1cm셀에 샘플 10mL를 채운다.

Note: *For the most accurate results, determine a reagent blank for each new lot of reagent by running the test using deionized water instead of sample.*



4. 셀을 기기 홈에 맞춰 끼워넣고 기기 덮개를 덮는다.

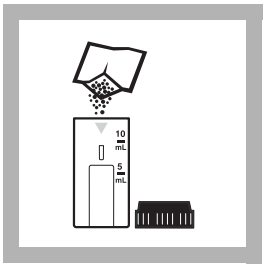
Note: *Place the cell into the cell holder as illustrated. The cell's tab should be at the 2 o'clock position. Make sure the sample cell tab is completely seated in the cell holder slot.*



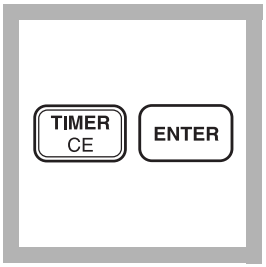
5. **ZERO**키를 누른다.

화면에 다음과 같이 표시된다:

0.00 mg/L Cl_2



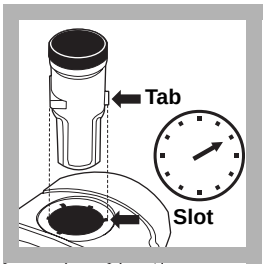
6. 셀을 셀 홀더에서 꺼낸 후 Monochlor-F pillow를 하나 넣는다. 20초가량 흔들어서 파우더를 용해 시킨다.



7. TIMER ENTER입력

5분간 반응시간이 표시된다.

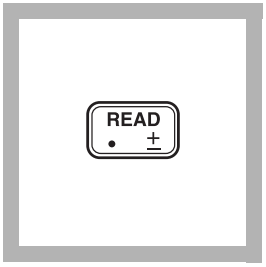
Note: *The color development time depends on the sample temperature. Refer to Table 3 for the actual time required.*



8. 타이머가 울리면 셀을 기기 홈에 맞춰서 끼우고 기기 덮개를 덮어 준다.

Note: *Place the cell into the cell holder as illustrated. The cell's tab should be at the 2-o'clock position. Make sure the sample cell tab is completely seated in the cell holder slot.*

* Patent pending



9. **READ**키를 누른다.

결과치가 mg/L monochloramine
(as Cl2 or chosen units)
으로 표시된다.

REQUIRED REAGENTS

Description	Quantity Required Per Test	Unit	Cat. No.
Monochlor F Reagent Pillows	1	50/pkg	28022-46

REQUIRED APPARATUS

Sample Cell, 10-mL/1-cm	1	2/pkg	48643-02
Clippers, shears	1	each	23694-00

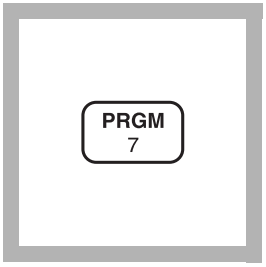
OPTIONAL REAGENTS

Rochelle Salt Solution	29-mL DB		1725-33
Organic-Free Water	500-mL		26415-49
Buffer Powder Pillows, pH 8.3	25/pkg		898-68
Nitrogen, Ammonia Standard Solution, 100 mg/L as NH_3-N	500-mL		24065-49
Chlorine Solution Voluette Ampule, 50–75 mg/L	16/pkg		14268-10

OPTIONAL APPARATUS

Beaker, 100-mL	each		500-42H
Flask, Volumetric, Class A, 100-mL	each		14574-42
Pipet, Mohr, Glass, 10-mL	each		20934-38
Pipet, Volumetric, Class A, 2.00 mL	each		14515-36
Pipet, Volumetric, Class A, 50.00 mL	each		14515-41
Stir Bar, Octagonal	each		20953-52
Stirrer, Magnetic, 110 V, 4” x 4”	each		28812-00

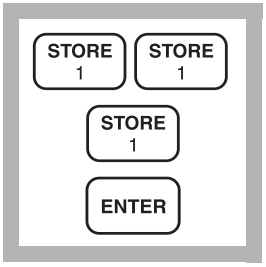
Indophenol Method* **For chlorinated drinking water and chlorinated wastewater**



1. Chloramine, HR 측정을 위해서 번호를 선택한다.

Press: **PRGM**
The display will show:
PRGM?

Note: *For most accurate results, perform a Reagent Blank Correction (Section 1 of the DR/800 Instrument Manual).*



2. 111을 누르고 **ENTER**입력.

화면에 다음 같이 표시:
mg/L Cl_2

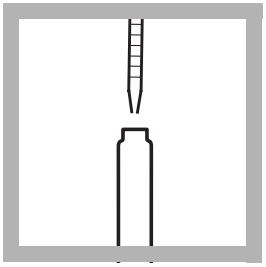
and then

Zero

Note: *For alternate forms, press the* **CONC** *key.*

3. COD/TNT용 바이알 아답타를 셀 홀더에 맞춰 끼운다.

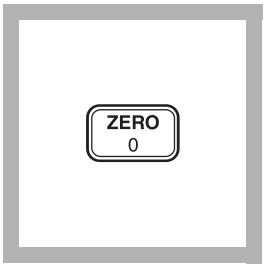
Note: *For better performance, adiffuser band covers the light path holes on the adapter. Do not remove the band.*



4. HR Monochloramine Diluent vial 한개의 마게를 열고, 유리피펫을 이용해서 2.0mL의 샘플을 바이알에 넣는다.
마개를 다시 닫고 수차례 흔들어서 섞어준다.

5. 바이알의 표면을 깨끗이 닦아낸다.

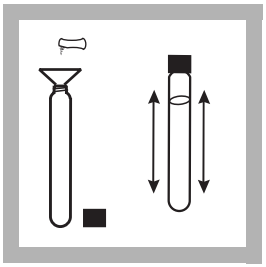
바이알을 아답타에 끼우고 기기 덮개를 덮는다.



6. **ZERO**키를 누른다.

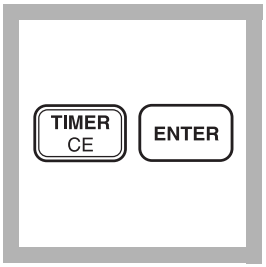
화면에 다음과 같이 표시된다:

0.0 mg/L Cl_2.



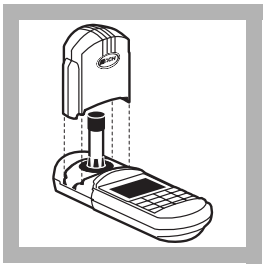
7. 바이알을 기기에서 꺼낸 후, 뚜껑을 열고 Monochlor.F pillow를 하나 넣는다.
다시 뚜껑을 닫은 후 20초가량 흔들어서 시약을 용해 시킨다.

Note: *Use the microfunnel as an aid in adding reagent powder to the vial.*

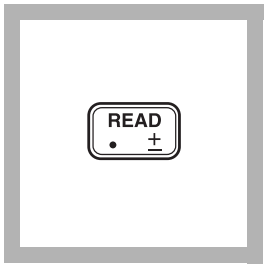


8. TIMER ENTER를 누른다. 5분간 반응 시간이 표시된다.

* U.S. Patent 6,315,950



9. 타이머가 울린 후에 바이알을 아답타에 끼우고 기기 덮개를 덮는다.



10. **READ**키를 누른다.

결과치가 mg/L monochloramine (as Cl2)로 표시된다.

REQUIRED REAGENTS

Description	Quantity Required Per Test	Unit	Cat. No.
HR Monochloramine Test ‘N Tubes, 50 tests	28	051-45	
Includes:			
HR Monochloramine Diluent Vials	50		*
Funnel, micro	1	each	25843-35
Monochlor F Reagent Pillows	1	50/pkg	28022-46

REQUIRED APPARATUS

COD/TNT Vial Adapter, DR/800	1	each	48464-00
Pipet, Mohr, glass, 2.00-mL	1	each	20936-36
Test Tube Rack	1	each	18641-00

OPTIONAL REAGENTS

Organic-free Water	500-mL		26415-49
Buffer Powder Pillows, pH 8.3	25/pkg		898-68
Nitrogen, Ammonia Standard Solution, 100-mg/L as NH_3–N	500-mL		24065-49
Chlorine Solution Voluette® Ampule, 50–75 mg/L, 10-mL	16/pkg		14268-10

OPTIONAL APPARATUS

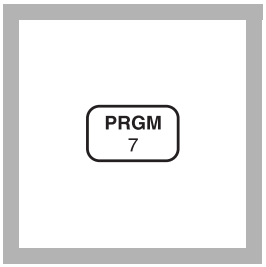
Beaker, 100-mL	each		500-42H
Clippers (medium powder pillows)	each		968-00
Clippers (shears)	each		23694-00
Flask, Volumetric, Class A, 100-mL	each		14574-42
Pipet, Mohr, Glass, 10-mL	each		20934-38
Pipet, Volumetric, Class A, 2.00-mL	each		14515-36
Pipet, Volumetric, Class A, 50.00-mL	each		14515-41
Stir Bar, Octagonal	each		20953-52
Stirrer, Magnetic, 110 V, 4” x 4”	each		23436-00

* Not sold separately.

DPD Method* **For water**

USEPA accepted for reporting for drinking water analysis

Using Powder Pillows

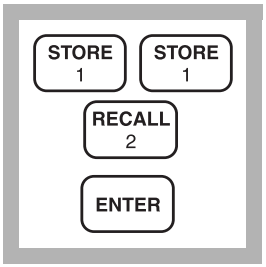


1. 다음 항목의 측정을 위해 번호를 선택한다: chlorine dioxide (ClO_2) powder pillows.

Press: **PRGM**

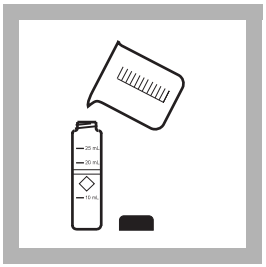
The display will show:

PRGM ?



2. 112번을 선택하고

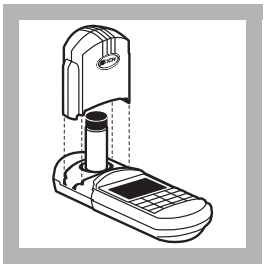
ENTER. 화면에 **mg/L, ClO2**와 **ZERO** 아이콘이 표시된다.



3. 샘플셀에 샘플을 10mL 채운다. (the blank)

Note: *Samples must be analyzed immediately and cannot be preserved for later analysis.*

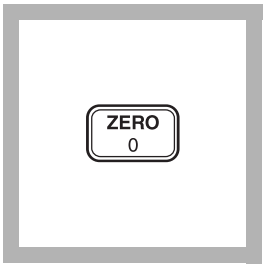
Note: *Wipe off any liquid or fingerprints before inserting the sample cell into the instrument.*



4. blank를 셀 홀더에 넣고 기기 덮개를 덮는다.

Note: *For best results, run a reagent blank using deionized water as the sample. Subtract the blank value from the sample reading to obtain the final result. See* Reagent Blank Correction *in Section 1 of the DR/800 Procedure Manual.*

* Procedure is equivalent to *Standard Method 4500, $Cl0_2P$*

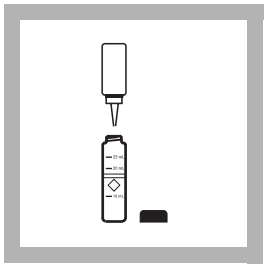


5. **ZERO**키를 누른다.

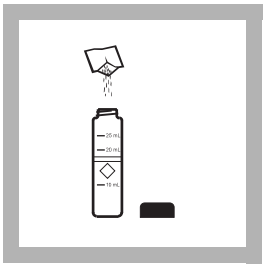
화면에 다음과 같이 나타난다:

0.00 mg/L ClO2

Note: *If Reagent Blank Correction is on, the display may flash* **"limit"**. *See Section 1 of the DR/800 Procedures Manual.*



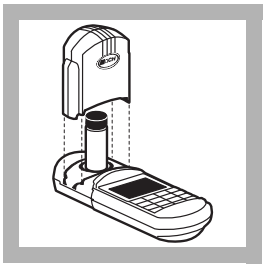
6. Glycine Reagent을 4방울 셀에 첨가한다. 저어서 섞어준다.



7. DPD Free Chlorine Powder Pillow를 셀에 첨가한다. 뚜껑을 닫고 흔들어 섞어준다. (the prepared sample)

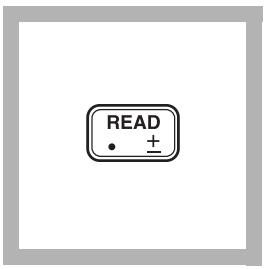
Note: *A pink color will develop if free chlorine dioxide is present.*

Note: *Perform step 9 within one minute of reagent addition.*



8. 30초정도 녹지 않은 파우더가 안정되길 기다린다. 셀을 셀 홀더에 넣고 기기 덮개를 덮는다.

Note: *Wipe off any liquid or fingerprints before inserting the sample cell into the instrument.*

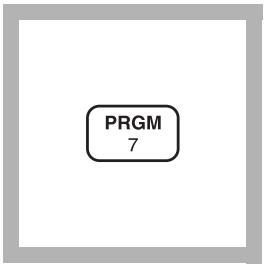


9. **READ**키를 누른다.

화면에 결과치가 mg/L chlorine dioxide로 나타난다.

Note: *If the sample temporarily turns yellow after reagent addition, or the display flashes* **"limit"**, *it is due to high chlorine dioxide levels. Dilute a fresh sample with chlorine dioxide-free water and repeat the test. A slight loss of chlorine dioxide may occur during dilution. Multiply the result by the dilution factor.*

Using AccuVac® Ampuls

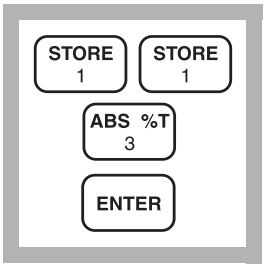


1. 다음 항목의 측정을 위해 번호를 선택한다: chlorine dioxide (ClO_2) AccuVac Ampuls.

Press: **PRGM**

The display will show:

PRGM ?



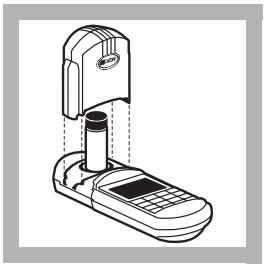
2. 113번을 선택하고

ENTER. 화면에 **mg/L, ClO2**와 **ZERO** 아이콘이 표시된다.

3. 샘플셀에 샘플을 10mL이상 채운다 (the blank). 50mL 비커에 샘플을 40mL 채운다. 정확한 샘플량을 사용하는것이 중요하다.

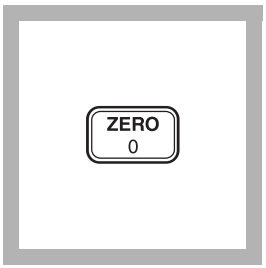
Note: *Samples must be analyzed immediately and cannot be preserved for later analysis.*

Note: *Wipe off any liquid or fingerprints before inserting the sample cell into the instrument.*



4. blank를 셀 홀더에 넣고 기기 덮개를 덮는다.

Note: *For best results, run a reagent blank using deionized water as the sample. Subtract the blank value from the sample reading to obtain the final result. See* Reagent Blank Correction *in Section 1 of the DR/800 Procedure Manual.*

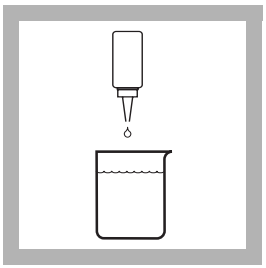


5. ZERO키를 누른다.

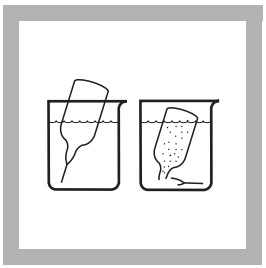
화면에 다음과 같이 나타난다:

0.00 mg/L ClO2

Note: *If Reagent Blank Correction is on, the display may flash "limit". See Section 1 of the DR/800 Procedures Manual.*



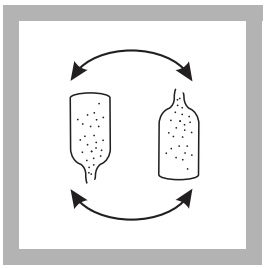
6. Glycine Reagent를 샘플이 담긴 비커에 16방울 떨어뜨리고 저어서 섞어준다.



7. DPD Free Chlorine Reagent AccuVac Ampul에 비커에 담긴 샘플을 채운다.

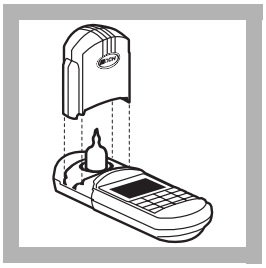
Note: *Keep the tip immersed while the ampul fills completely.*

Note: *Perform step 10 within one minute of reagent addition.*

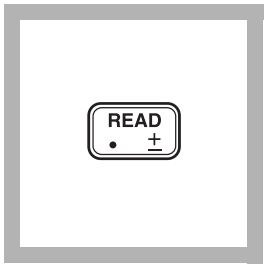


8. 앰퓰을 빠르게 수차례 뒤집어서 섞어준다. 앰퓰의 표면을 깨끗이 닦아준다.

Note: *A pink color will form if chlorine dioxide is present.*



9. 30여초간 녹지않은 파우더가 안정되길 기다린다. 앰플을 셀 홀더에 넣고 기기 덮개를 덮는다.



10. **READ**키를 누른다.

화면에 결과치가 mg/L chlorine dioxide 로 나타난다.

Note: *If the sample temporarily turns yellow after reagent addition, or the display flashes "limit", it is due to high chlorine dioxide levels. Dilute a fresh sample with chlorine dioxide-free water and repeat the test. A slight loss of chlorine dioxide may occur during dilution. Multiply the result by the dilution factor.*

REQUIRED REAGENTS (Using Powder Pillows)

Description	Quantity Required per test	Unit	Cat. No.
Chlorine Dioxide DPD/Glycine Reagent Set (100 tests)			27709-00
Includes one of each:			
DPD Free Chlorine Reagent Powder Pillows, 10 mL	1 pillow	100/pkg	21055-69
Glycine Reagent	4 drops	29 mL	27621-33

REQUIRED REAGENTS (Using AccuVac® Ampuls)

Chlorine Dioxide DPD/Glycine AccuVac® Ampul Reagent Set (25 tests)			27710-00
Includes one of each:			
DPD Free Chlorine Reagent AccuVac® Ampuls	1	25/pkg	25020-25
Glycine Reagent	16 drops	29 mL	27621-33

OPTIONAL REAGENTS

Chlorine Standard Solution, Voluette™ ampule, 50-75 mg/L, 10 mL	16/pkg	14268-10
DPD Free Chlorine Reagent, SwifTest™	250 tests	28023-00
Potassium Iodide Solution, 30 g/L	100 mL* MDB	343-32
Sodium Arsenite, 5 g/L	100 mL* MDB	1047-32
Sodium Hydroxide Standard Solution, 1.000 N	100 mL* MDB	1045-32
Sulfuric Acid Standard Solution, 1.000 N	100 mL* MDB	1270-32
Water, deionized	4 L	272-56
Water, sterile, chlorine dioxide-free	500 mL	26415-49

OPTIONAL APPARATUS

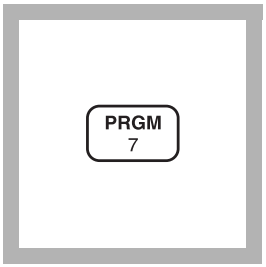
AccuVac® Snapper Kit	each	24052-00
Cylinder, graduated, 25 mL	each	508-40
pH Meter, *sension™1*, portable, with electrode	each	51700-10
pH Paper, 1 to 11 pH units	5 rolls/pkg	391-33
Pipet, TenSette®, 0.1 to 1.0 mL	each	19700-01
Pipet Tips, for 19700-01 TenSette® Pipet	50/pkg	21856-96
Pipet Tips, for 19700-01 TenSette® Pipet	1000/pkg	21856-28
PourRite™ Ampule Breaker	each	24846-00

For Technical Assistance, Price and Ordering
In the U.S.A.—Call 800-227-4224
Outside the U.S.A.—Contact the Hach office or distributor serving you.

* Marked Dropper Bottle - contact Hach for larger sizes.

CHLORINE DIOXIDE, Mid Range (0 to 50.0 mg/L) For water and wastewater

Direct Reading Method

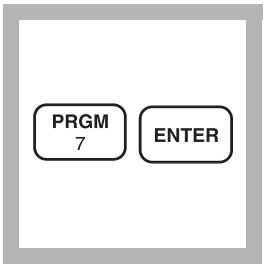


1. 다음 항목의 측정을 위해 번호를 선택한다: mid-range chlorine dioxide (ClO_2).

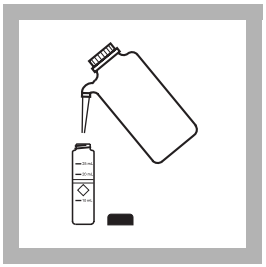
Press: **PRGM**

The display will show:

PRGM ?

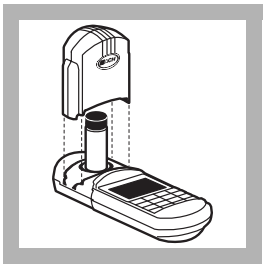


2. 7번을 선택하고 **ENTER.** 화면에 **mg/L, ClO2**와 **ZERO** 아이콘이 나타난다.

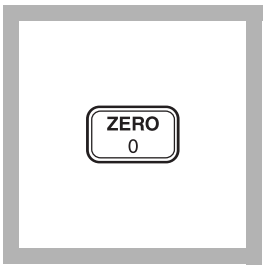


3. 샘플셀에 증류수를 10mL 채운다. (the blank)

Note: *Analyze samples immediately after collection.*



4. blank를 셀 홀더에 넣고 기기 덮개를 덮는다.

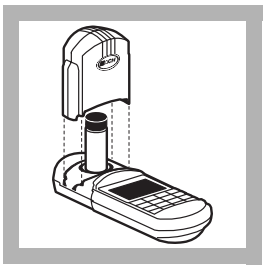


5. ZERO키를 누른다.

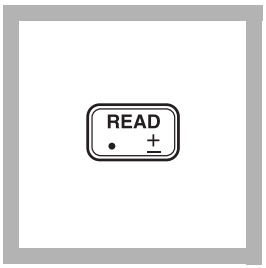
화면에 다음과 같이 나타난다:

0.0 mg/L ClO2

6. 다른 샘플셀에 샘플 10mL을 담는다. (the prepared sample)



7. 샘플을 담은 셀을 셀 홀더에 넣고 기기 덮개를 덮는다.



8. READ키를 누른다.

화면에 결과치가 mg/L chlorine dioxide로 나타난다.

Note: *If the display flashes "limit" it is due to high ClO_2 levels. A slight loss of chlorine dioxide may occur during dilution. Dilute a fresh sample and repeat the test. Multiply the result by the dilution factor; see Section 1.*

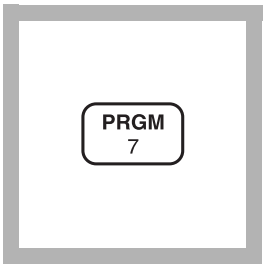
REQUIRED REAGENTS AND APPARATUS

Description	Quantity Required Per Test	Unit	Cat. No.
Sample Cell, 10-20-25 mL, w/ cap	2	6/pkg	24019-06
Water, deionized	10 mL	4 L	272-56

Outside the U.S.A.—Contact the Hach office or distributor serving you.

DPD Method

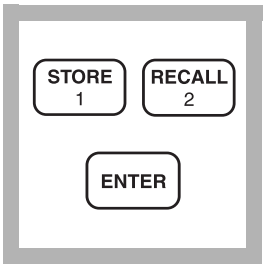
USEPA accepted for reporting drinking water analyses*
For testing higher levels of free chlorine (hypochlorous acid and hypochlorite) in drinking water, cooling water, and industrial process waters



1. Chlorine, UHR를 측정하기 위해 번호를 선택한다.

Press: **PRGM**
The display will show:
PRGM?

Note: *If the chlorine is typically less than 2.0 mg/L, use method 8021, program number 9.*

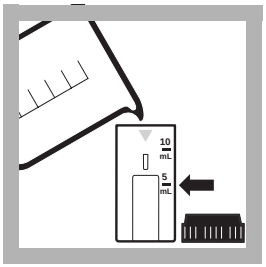


2. 12번을 선택하고 **ENTER**

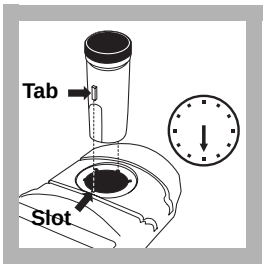
화면에 다음같이 표시:

mg/L Cl_2

then: **ZERO**



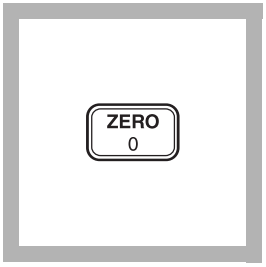
3. 10mL/1cm셀의 5mL표시까지 샘플을 채운다.



4. 셀을 셀 홀더에 넣고 기기 덮개를 덮어 준다.

Note: *Place the cell into the cell holder as illustrated. The sample cell tab should be at the 6 o'clock position and completely seated in the cell holder slot.*

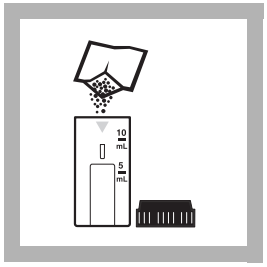
* Procedure is equivalent to USEPA method 330.5 for wastewater and Standard Method 4500-C1-G for drinking water.



5. **ZERO**키를 누른다.

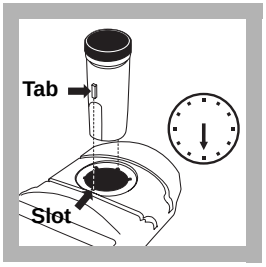
화면에 다음같이 표시된다:

0.0 mg/L Cl_2



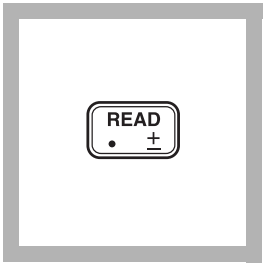
6. 샘플 셀을 꺼내서 25mL DPD Free Chlorine Reagent pillow를 하나 첨가한다. 뚜껑을 닫고 셀을 약 20여초 흔들어서 용해시킨다. 즉시 다음단계를 진행한다.

Note: *A pink color will develop if chlorine is present.*



7. 샘플 셀을 기기에 넣고 기기 덮개를 덮어준다.

Note: *Place the sample cell into the cell holder as illustrated. The sample cell tab should be at the 6-o'clock position and completely seated in the cell holder slot.*



8. 시약첨가 후 1분안에 READ키를 눌러주어야 한다. 결과치가

mg/L chlorine (as Cl2)

로 표시된다.

Note: *See "Interferences" on page 104 for samples with high monochloramine concentrations.*

REQUIRED REAGENTS

Description	Quantity Required Per Test	Unit	Cat. No.
DPD Free Chlorine Reagent Powder Pillows, 25-mL	1	100/pkg	14070-99

REQUIRED APPARATUS

Sample Cell, 10-mL/1-cm	1	2/pkg	48643-02

OPTIONAL REAGENTS

Chlorine Standard Solution, 2-mL Voluette® Ampule, 50–75 mg/L		20/pkg	14268-20
Potassium Iodide Solution, 30-g/L		100 mL MDB	343-32
Sodium Arsenite Solution, 5-g/L		100 mL MDB	1047-32
Sodium Hydroxide Standard Solution, 1.00 N		100 mL MDB	1045-32
Sulfuric Acid Standard Solution, 1.000 N		100 mL MDB	1270-32
Water, deionized		4 L	272-56

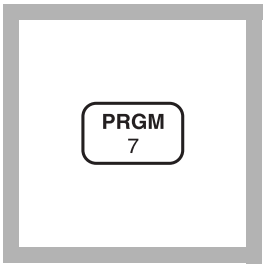
OPTIONAL APPARATUS

Ampule Breaker Kit		each	24846-00
Cylinder, graduated, 10-mL, mixing		each	20886-38
pH Meter, sens*ion*™1, portable, with electrode		each	51700-10
Pipet, TenSette®, 0.1 to 1.0 mL		each	19700-01
Pipet Tips, for 19700-01 TenSette Pipet		50/pkg	21856-96
Pipet Tips, for 19700-01 TenSette Pipet		1000/pkg	21856-28

CHLORINE, TOTAL, Ultra-High Range (0.0–10.0 mg/L Cl_2) Method 10070

DPD Method

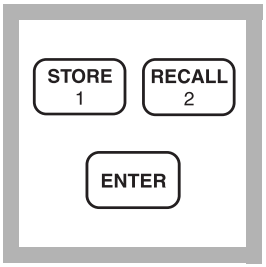
USEPA accepted for reporting water and wastewater analyses*
For testing higher levels of total chlorine (free and combined) in drinking water, cooling water, industrial process waters, or treated wastewater



1. Chlorine, UHR을 측정하기 위해 프로그램 번호를 선택한다.

Press: **PRGM**
The display will show:
PRGM?

Note: *If the chlorine is typically less than 2.0 mg/L, use method 8167, program number 9.*

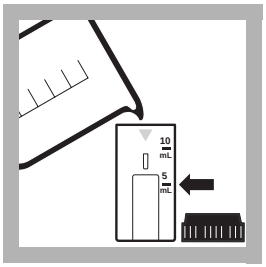


2. 12번을 선택하고 **ENTER**

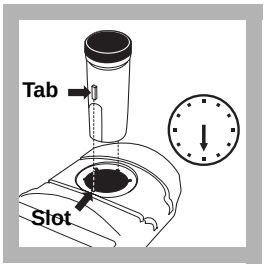
화면에 다음같이 표시:

mg/L Cl_2

then: **ZERO**



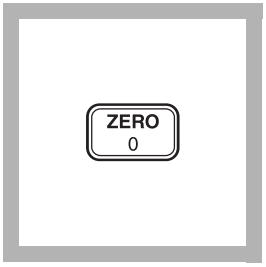
3. 10mL/1cm셀에 5mL 표시까지 샘플을 채운다.



4. 셀을 홈에 맞춰 기기에 끼우고 기기 덮개를 덮어준다.

Note: *Place the cell into the cell holder as illustrated. The sample cell tab should be at the 6 o'clock position and completely seated in the cell holder slot.*

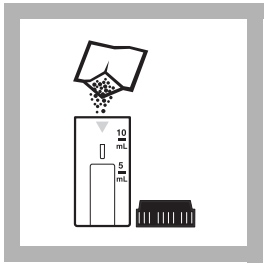
* Procedure is equivalent to USEPA method 330.5 for wastewater and Standard Method 4500-C1-G for drinking water.



5. **ZERO**키를 누른다.

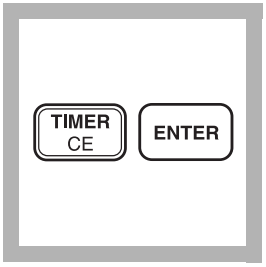
화면에 다음같이 나타난다:

0.0 mg/L Cl_2



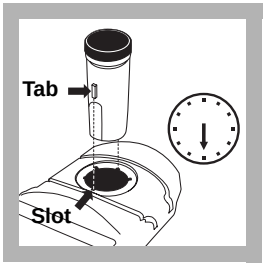
6. 샘플셀을 홀더에서 꺼내서 25mL DPD Total Chlorine Reagent pillow 를 넣고, 뚜껑을 닫은 뒤 약 20초 가량 흔들어서 용해 시킨다.

Note: *A pink color will develop if chlorine is present.*



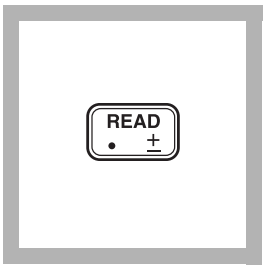
7. **TIMER ENTER**입력.

3분간의 반응 시간이 표시된다.



8. 타이머가 울린 후 3분안에 샘플 셀을 셀 홀더에 넣고 기기 덮개를 덮어준다.

Note: *Place the cell into the cell holder as illustrated. The sample cell tab should be at the 6-o'clock position and completely seated in the cell holder slot.*



9. **READ**키를 누른다.

결과치가
mg/L chlorine (as Cl_2)
로 나타난다.

REQUIRED REAGENTS

Description	Quantity Required Per Test	Unit	Cat. No.
DPD Total Chlorine Reagent Powder Pillows, 25-mL	1	100/pkg	14064-99

REQUIRED APPARATUS

Sample Cell, 10-mL/1-cm	1	2/pkg	48643-02

OPTIONAL REAGENTS

Chlorine Standard Solution, 2-mL Voluette® Ampule, 50–75 mg/L		20/pkg	14268-20
Potassium Iodide Solution, 30-g/L		100 mL MDB	343-32
Sodium Arsenite Solution, 5-g/L		100 mL MDB	1047-32
Sodium Hydroxide Standard Solution, 1.00 N		100 mL MDB	1045-32
Sulfuric Acid Standard Solution, 1.000 N		100 mL MDB	1270-32
Water, deionized		4 L	272-56

OPTIONAL APPARATUS

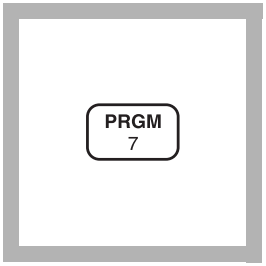
Ampule Breaker Kit		each	24846-00
Cylinder, graduated, 10-mL, mixing		each	20886-38
pH Meter, sens*ion*™1, portable, with electrode		each	51700-10
Pipet, TenSette®, 0.1 to 1.0 mL		each	19700-01
Pipet Tips, for 19700-01 TenSette Pipet		50/pkg	21856-96
Pipet Tips, for 19700-01 TenSette Pipet		1000/pkg	21856-28

CHLORINE, FREE (0 to 2.00 mg/L)

DPD Method (Powder Pillows or AccuVac Ampuls)

USEPA accepted for reporting wastewater and drinking water analyses*

Using Powder Pillows



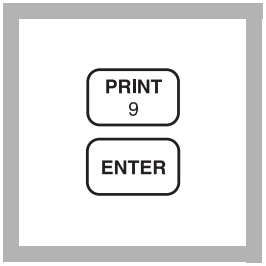
1. free & total chlorine (Cl2)측정을 위해 프로그램 번호를 선택한다.

Press: **PRGM**

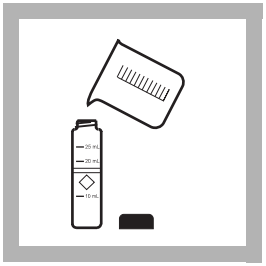
The display will show:

PRGM ?

Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*



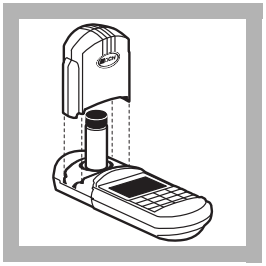
2. 9번을 선택하고 **ENTER.** 화면에 **mg/L, Cl2** 와 **ZERO** 아이콘 표시.



3. 샘플 셀에 10mL 표시까지 샘플을 채운다. (the blank).

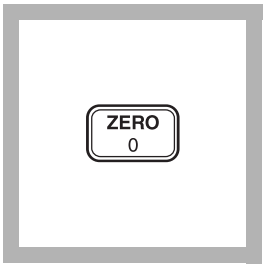
Note: *Samples must be analyzed immediately and cannot be preserved for later analysis.*

Note: *The SwifTest Dispenser for Free Chlorine can be used in place of the powder pillows in step 7.*



4. blank를 셀 홀더에 끼우고 기기 덮개를 덮어준다.

* Procedure is equivalent to USEPA method 330.5 for wastewater and Standard Method 4500-Cl G for drinking water.



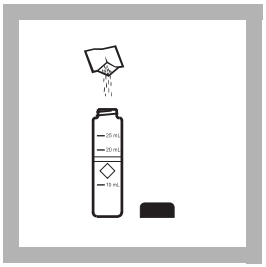
5. ZERO키를 누른다.

화면에 다음과 같이 나타난다:

0.00 mg/L Cl2

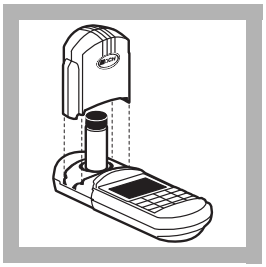
Note: *If Reagent Blank Correction is on, the display may flash "limit". See Section 1.*

6. 다른 샘플 셀에 샘플 10mL를 담는다.



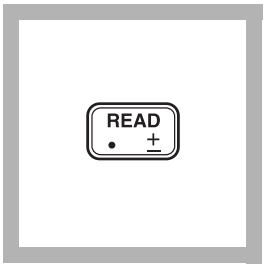
7. 샘플 셀에 DPD Free Chlorine Powder Pillow를 넣는다. (the prepared sample). 뚜껑을 닫고 강하게 흔들어서 파우더를 용해 시킨다.

Note: *A pink color will develop if free chlorine is present.*



8. 즉시 측정할 샘플을 셀 홀더에 넣고 기기 덮개를 덮어준다.

Note: *Perform Step 9 within one minute of reagent addition.*



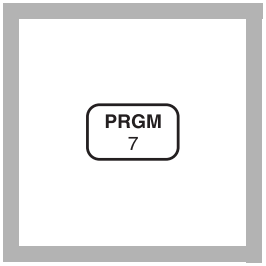
9. READ키를 누른다.

결과치가 mg/L chlorine 으로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Section 1).*

Note: *If the sample temporarily turns yellow after reagent addition, or the display flashes "limit", it is due to high chlorine levels. Dilute a fresh sample and repeat the test. A slight loss of chlorine may occur during dilution. Multiply the result by the dilution factor; see Section 1. Or, use the High Range Free Chlorine test, program #8.*

Using AccuVac Ampuls



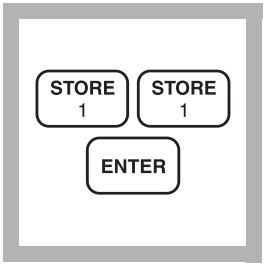
1. free and total chlorine (Cl2)의 AccuVac Ampuls측정을 위해 번호를 선택한다.

Press: **PRGM**

The display will show:

PRGM ?

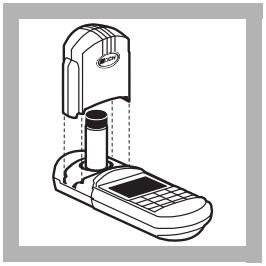
Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*



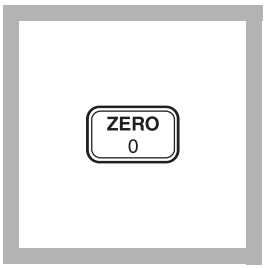
2. 11번을 선택하고 **ENTER**입력. 화면에 **mg/L, Cl2** 와 **ZERO** 아이콘 표시.

3. 샘플 셀에 샘플을 최소한 10mL 이상 담는다.(the blank). 비커에 최소 40mL 이상 샘플을 담아둔다.

Note: *Samples must be analyzed immediately and cannot be preserved for later analysis.*



4. blank를 셀 홀더에 끼우고 기기 덮개를 덮어준다.

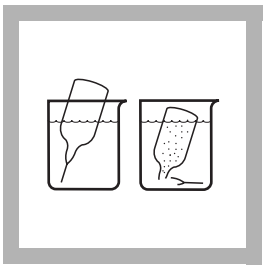


5. ZERO키를 누른다.

화면에 다음과 같이 나타난다:

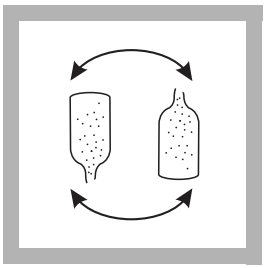
0.00 mg/L Cl2

Note: *If Reagent Blank Correction is on, the display may flash "limit". See Section 1.*



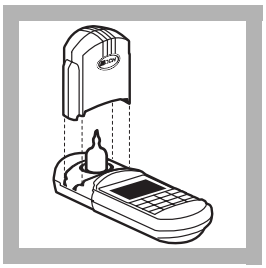
6. DPD Free Chlorine Reagent AccuVac Ampul에 샘플을 채운다.

Note: *Keep the tip immersed while the ampule fills completely.*



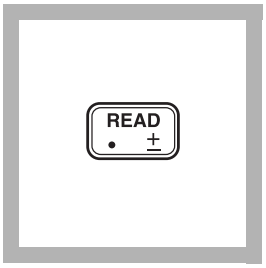
7. 빠르게 수차례 뒤집어서 섞어준다. 표면을 깨끗이 닦는다.

Note: *A pink color will form if chlorine is present.*



8. 즉각적으로 AccuVac Ampul을 셀 홀더에 넣고 기기 덮개를 덮어준다.

Note: *Perform step 9 within one minute of reagent addition.*



9. **READ**키를 누른다.

결과치가
mg/L chlorine으로
나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Section 1).*

Note: *If the sample temporarily turns yellow after reagent addition, or the display flashes "limit", it is due to high chlorine levels. Dilute a fresh sample and repeat the test. A slight loss of chlorine may occur during dilution. Multiply the result by the dilution factor; see Section 1.*

REQUIRED REAGENTS & APPARATUS (Using Powder Pillows)

Description	Quantity Required Per Test	Unit	Cat. No.
DPD Free Chlorine Powder Pillows, 10 mL	1 pillow	100/pkg	21055-69
Sample Cell, 10, 20, 25 mL, w/ cap	2	6/pkg	24019-06

REQUIRED REAGENTS & APPARATUS (Using AccuVac Ampuls)

DPD Free Chlorine Reagent AccuVac Ampuls	1 ampul	25/pkg	25020-25
Beaker, 50 mL	1	each	500-41H

OPTIONAL REAGENTS

Description	Unit	Cat. No.
Chlorine Standard Solution, PourRite ampule, 25-30 mg/L, 2 mL	20/pkg	26300-20
DPD Free Chlorine Reagent, SwifTest	250 tests	28023-00
Potassium Iodide Solution, 30 g/L	100 mL* MDB	343-32
Sodium Arsenite, 5 g/L	100 mL* MDB	1047-32
Sodium Hydroxide Standard Solution, 1.000 N	100 mL* MDB	1045-32
Sulfuric Acid Standard Solution, 1.000 N	100 mL* MDB	1270-32
Water, deionized	4 L	272-56

OPTIONAL APPARATUS

AccuVac Snapper Kit	each	24052-00
Cylinder, graduated, 25 mL	each	508-40
pH Meter, *sension*™*1*, portable, with electrode	each	51700-10
pH Paper, 1 to 11 pH units	5 rolls/pkg	391-33
Pipet, TenSette, 0.1 to 1.0 mL	each	19700-01
Pipet Tips, for 19700-01 TenSette Pipet	50/pkg	21856-96Pipet
Tips, for 19700-01 TenSette Pipet	1000/pkg	21856-28
PourRite Ampule Breaker	each	24846-00

For Technical Assistance, Price and Ordering

In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

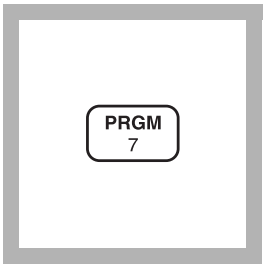
* Marked Dropper Bottle - contact Hach for larger sizes.

CHLORINE, TOTAL (0 to 2.00 mg/L)

DPD Method (Powder Pillows or AccuVac Ampuls)

USEPA accepted for reporting water and wastewater analyses*

Using Powder Pillows



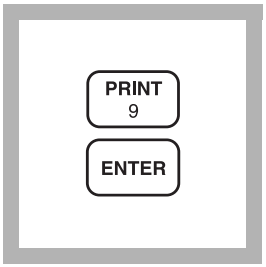
1. total chlorine (Cl2) powder pillows 방식 측정을 위해 번호를 선택한다.

Press: **PRGM**

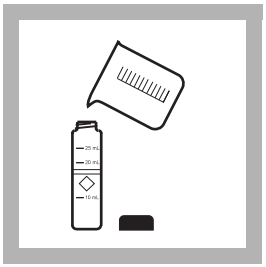
The display will show:

PRGM ?

Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*

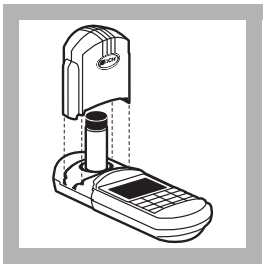


2. **9**번을 선택하고 **ENTER**입력. 화면에 **mg/L, Cl2** 와 **ZERO** 아이콘 표시.



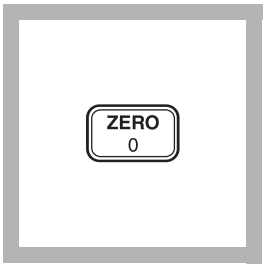
3. 샘플셀에 샘플을 10mL 채운다. (the blank).

Note: *Samples must be analyzed immediately and cannot be preserved for later analysis.*



4. blank를 셀 홀더에 끼우고 기기 덮개를 덮어준다.

* Procedure is equivalent to USEPA method 330.5 for wastewater and Standard Method 4500-Cl G for drinking water.



5. **ZERO**키를 누른다.

화면에 다음과 같이 나타난다:

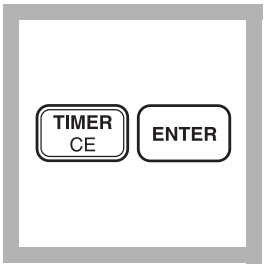
0.00 mg/L Cl2

Note: *If Reagent Blank Correction is on, the display may flash "limit". See Section 1.*

6. 두번째 샘플 셀에 샘플을 10mL 표시까지 채운다.

7. 샘플 셀에 DPD Total Chlorine Powder Pillow의 내용물을 넣는다. (prepared sample). 뚜껑을 닫고 강하게 흔들어서 파우더를 용해 시킨다.

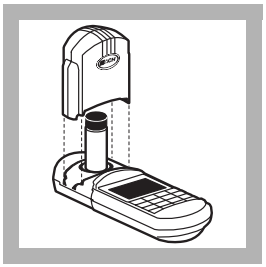
Note: *It is not necessary that all the powder dissolves.*



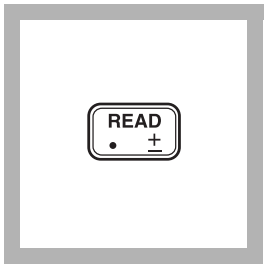
8. **TIMER ENTER** 입력.

3분간의 반응시간이 시작된다. chlorine이 존재하면 분홍색이 나타난다.

Note: *The SwifTest Dispenser for Total Chlorine can be used in place of the powder pillows in step 7.*



9. 타이머가 울린 후에 준비된 샘플을 끼우고 기기 덮개를 덮어준다.



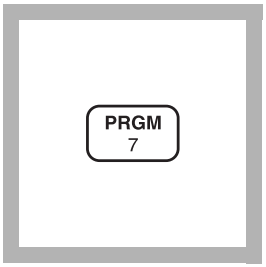
10. **READ**키를 누른다.

결과치가 mg/L total chlorine 으로 표시된다.

Note: *It the sample temporarily turns yellow after sample addition, or the display flashes "limit", it is due to high chlorine levels. Dilute a fresh sample and repeat the test. A slight loss of chlorine may occur during dilution. Multiply the result by the dilution factor; see Section 1. Or use the High Range Total Chlorine test, program #8.*

Note: *Standard Adjust may be performed using a prepared standard (see Standard Adjust in Section 1).*

Using AccuVac Ampuls



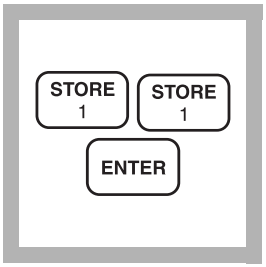
1. total chlorine (Cl2) AccuVac Ampuls 방식 측정을 위해서 번호를 선택한다.

Press: **PRGM**

The display will show:

PRGM ?

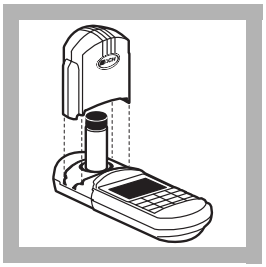
Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*



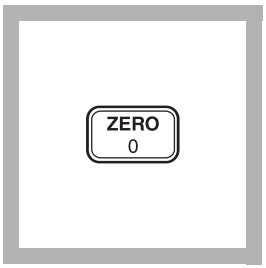
2. **11**을 선택하고 **ENTER**입력. 화면에 **mg/L, Cl2** 와 **ZERO** 아이콘 표시.

3. 샘플 셀에 샘플을 최소한 10mL 이상 채운다. (the blank). 비커에 최소 40 mL이상 샘플을 채운다.

Note: *Samples must be analyzed immediately and cannot be preserved for later analysis.*



4. blank를 셀홀더에 끼우고 기기 덮개를 덮어준다.

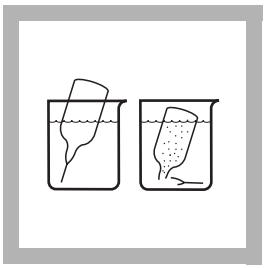


5. **ZERO**키를 누른다.

화면에 다음과 같이 나타난다:

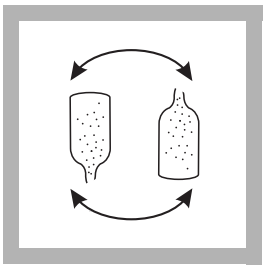
0.00 mg/L Cl2

Note: *If Reagent Blank Correction is on, the display may flash "limit". See Section 1.*



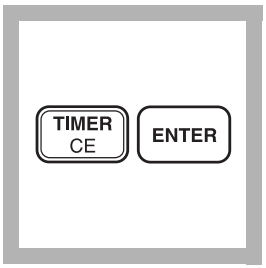
6. DPD Total Chlorine Reagent AccuVac Ampul에 샘플을 채운다.

Note: *Keep the tip immersed while the ampule fills completely.*



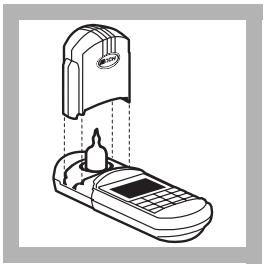
7. ampule을 수차례 빠르게 뒤집어서 섞어 준다. 표면을 깨끗이 닦아낸다.

Note: *A pink color will form if chlorine is present.*

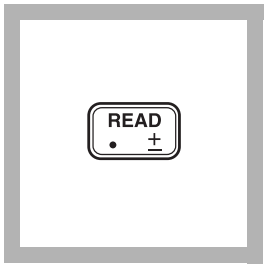


8. **TIMER ENTER** 입력.

3분간 반응시간이 시작된다.



9. 타이머가 울리면 AccuVac Ampul을 셀 홀더에 끼우고 기기 덮개를 덮는다.



10. **READ**키를 누른다.

결과치가 mg/L total chlorine 으로 표시된다.

Note: *If the sample temporarily turns yellow after sample addition, or the display shows "limit", it is due to high chlorine levels. Dilute a fresh sample and repeat the test. A slight loss of chlorine may occur during dilution. Multiply the result by the appropriate dilution factor; see Section 1.*

Note: *Standard Adjust may be performed using a prepared standard (see Section 1).*

REQUIRED REAGENTS & APPARATUS (USING POWDER PILLOWS)

Description	Qty/Test	Unit	Cat. No.
DPD Total Chlorine Reagent Powder Pillows	1 pillow	100/pkg	21056-69
Sample Cell, 10-20-25 mL, w/caps	2	6/pkg	24019-06

REQUIRED REAGENTS & APPARATUS (USING ACCUVAC AMPULS)

DPD Total Chlorine Reagent AccuVac Ampuls	1 ampul	25/pkg	25030-25
Beaker, 50 mL	1	each	500-41H

OPTIONAL REAGENTS

Description	Unit	Cat. No.
Chlorine Standard Solution, PourRite ampule, 25-30 mg/L Cl_2	20/pkg	26300-20
DPD Total Chlorine Reagent, SwifTest	250 tests	28024-00
Potassium Iodide Solution, 30 g/L	100 mL* MDB	343-32
Sodium Arsenite, 5 g/L	100 mL* MDB	1047-32
Sodium Hydroxide Standard Solution, 1 N	100 mL* MDB	1045-32
Sulfuric Acid Standard Solution, 1 N	100 mL* MDB	1270-32
Water, deionized	4 L	272-56

OPTIONAL APPARATUS

AccuVac Snapper Kit	each	24052-00
PourRite Ampule Breaker	each	24846-00
Cylinder, graduated, 25 mL	each	508-40
pH Indicator Paper, 1 to 11 pH units	5 rolls/pkg	391-33
pH Meter, *sension*™*1*, portable	each	51700-00
Pipet, TenSette, 0.1 to 1.0 mL	each	19700-01
Pipet Tips, for 19700-01 TenSette Pipet	50/pkg	21856-96
Pipet Tips, for 19700-01 TenSette Pipet	1000/pkg	21856-28

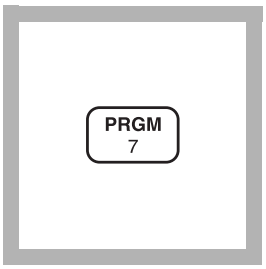
For Technical Assistance, Price and Ordering

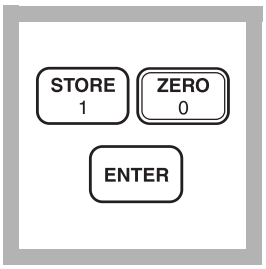
In the U.S.A.—Call 800-227-4224

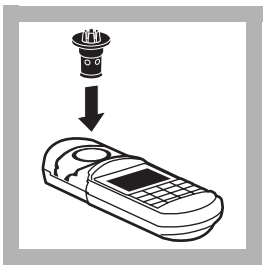
Outside the U.S.A.—Contact the Hach office or distributor serving you.

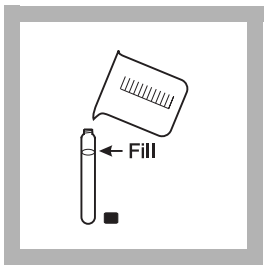
* Marked Dropper Bottle - contact Hach for larger sizes.

DPD Test 'N Tube™ Method*









1. freechlorine (Cl2)의 Test 'N Tube 방식 측정을 위해 번호를 선택한다.

Press: **PRGM**

The display will show:

PRGM ?

Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*

2. 10을 선택하고

ENTER입력. 화면에 **mg/L, Cl2** 와 **ZERO** 아이콘 표시.

3. COD/TNT 측정용 바이알 아답타를 기기에 맞춰서 끼운다.

Note: *For increased performance, a diffuser band covers the light path holes on the adapter. Do not remove the diffuser band.*

4. 비어있는 Test 'N Tube 바이알에 샘플을 채운다. (the blank).

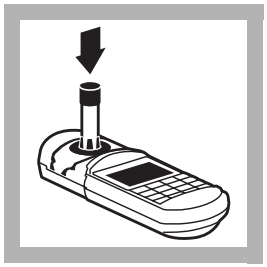
Note: *Fill to the top of the Hach logo "oval" mark.*

Note: *Samples must be analyzed immediately and cannot be preserved for later analysis.*

* Adapted from *Standard Methods for the Examination of Water and Wastewater*

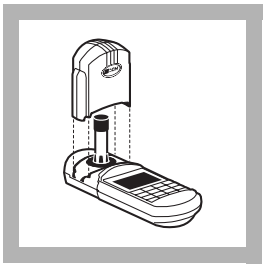
5. blank 바이알 표면을 깨끗이 닦아준다.

Note: *Wiping with a damp cloth followed by a dry one removes fingerprints and other marks.*

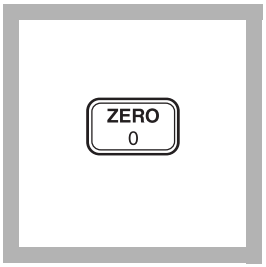


6. blank를 기기 아답타에 맞춰 끼운다.

Note: *Do not move the vial from side to side as this can cause errors.*



7. 바이알 위로 기기 덮개를 덮어준다.

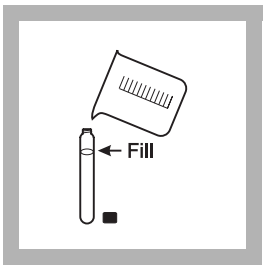


8. ZERO키를 누른다.

화면에 다음과 같이 표시된다:

0.00 mg/L Cl2

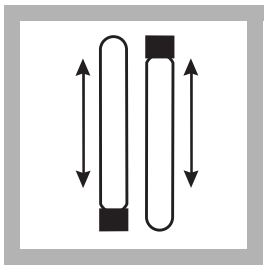
Note: *If Reagent Blank Correction is on, the display may show "limit". See Section 1.*



9. Free Chlorine DPD TNT tube의 마개를 열고 샘플을 10mL 넣어준다.

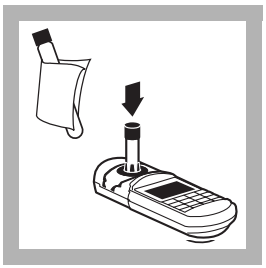
Note: *Fill to the top of the Hach logo "oval" mark.*

Note: *A pink color will develop if chlorine is present.*



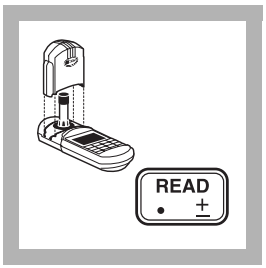
10. 마개를 닫고 최소 10번이상 흔들어서 파우더를 용해 시킨다. (prepared sample).

Note: *Use slow, deliberate inversion for complete recovery. Ten inversions should take at least 30 seconds. One inversion equals turning the vial upside down, then returning it to an upright position.*



11. 섞어준후 30초 안에 바이알의 표면을 닦고 기기 아답타에 끼워 넣는다.

Note: *Do not move the vial from side to side as this can cause errors.*



12. 바이알 위로 기기 덮개를 덮어준다.

READ 키를 누른다.

결과치가 mg/L free chlorine 으로 나타난다.

REQUIRED REAGENTS

Description	Quantity Required Per Test	Unit	Cat. No.
Test 'N Tube DPD Free Chlorine Reagent	1 vial	50/pkg	21055-45
Test 'N Tube Vials	1 vial	6/pkg	22758-06

REQUIRED APPARATUS

Caps, white	1 cap	6/pkg	22411-06
COD/TNT Adapter	1	each	48464-00

OPTIONAL REAGENTS

Chlorine Standard Solution, PourRite ampule, 50-75 mg/L, 2 mL		20/pkg	14268-20
Potassium Iodide Solution, 30 g/L	100 mL*	MDB	343-32
Sodium Arsenite, 5 g/L	100 mL*	MDB	1047-32
Sodium Hydroxide Standard Solution, 1.000 N	100 mL*	MDB	1045-32
Sulfuric Acid Standard Solution, 1.000 N	100 mL*	MDB	1270-32

OPTIONAL APPARATUS

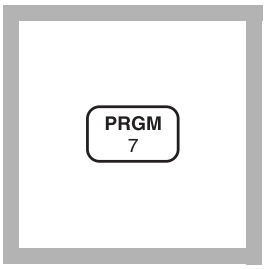
Beaker, 50 mL		each	500-41H
pH Meter, *sension*™*1*, portable, with electrode		each	51700-10
pH Paper, pH 1 to 11 pH		5 rolls/pkg	391-33
Pipet, TenSette, 0.1 to 1.0 mL		each	19700-01
Pipet Tips, for 19700-01 TenSette Pipet		50/pkg	21856-96
Pipet Tips, for 19700-01 TenSette Pipet		1000/pkg	21856-28
PourRite Ampule Breaker		each	24846-00
Test Tube Rack		each	18641-00

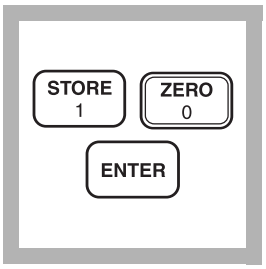
* Marked Dropper Bottle - contact Hach for larger sizes.

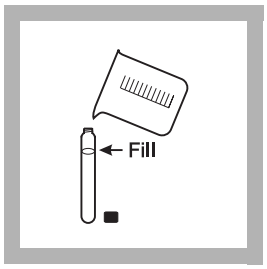
CHLORINE, TOTAL (0 to 5.00 mg/L)

For water, wastewater and seawater

DPD Test ‘N Tube™ Method*







1. total chlorine (Cl2)의 Test 'N Tube 방식 측정을 위해 번호를 선택한다.

Press: **PRGM**

The display will show:

PRGM ?

Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*

2. 10번을 선택하고

ENTER입력. 화면에 **mg/L, Cl2** 와 **ZERO** 아이콘 표시.

3. COD/TNT 측정용 바이알 아답타를 기기에 맞춰서 끼운다.

Note: *For increased performance, a diffuser band covers the light path holes on the adapter. Do not remove the diffuser band.*

4. 비어있는 Test ‘N Tube 바이알에 샘플을 채운다.(the blank).

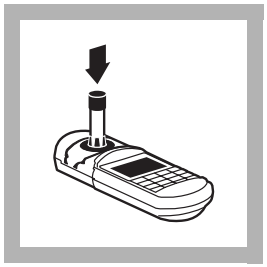
Note: *Fill to the top of the Hach logo “oval” mark.*

Note: *Samples must be analyzed immediately and cannot be preserved for later analysis.*

* Adapted from *Standard Methods for the Examination of Water and Wastewater.*

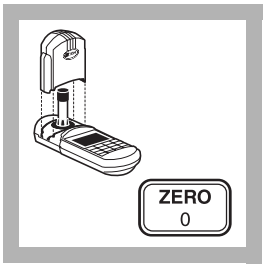
5. blank바이알의 표면을 깨끗이 닦아준다.

Note: *Wiping with a damp cloth followed by a dry one removes fingerprints and other marks.*



6. blank를 아답타에 맞춰서 끼운다.

Note: *Do not move the vial from side to side as this can cause errors.*



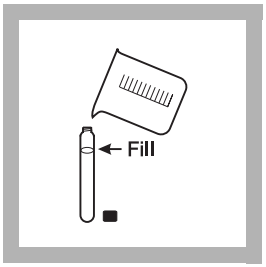
7. 바이알을 기기 덮개로 덮어준다.

ZERO키를 누른다.

화면에 다음과 같이 나타난다:

0.00 mg/L Cl2

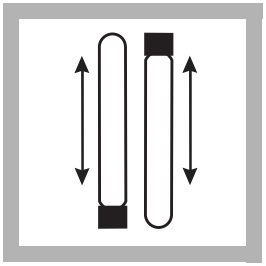
Note: *If Reagent Blank Correction is on, the display may flash "limit". See Section 1.*



8. Total Chlorine DPD TNT tube의 마개를 열고 샘플 10mL를 넣어준다.

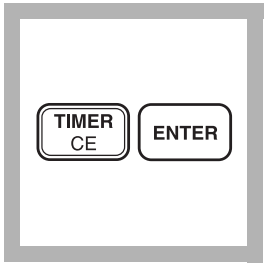
Note: *Fill to the top of the Hach logo "oval" mark.*

Note: *A pink color will develop if chlorine is present.*



9. 마게를 다시 닫고 최소 10번 이상 흔들어 파우더를 용해 시킨다. (prepared sample).

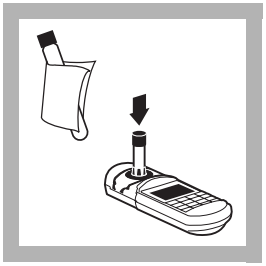
Note: *Use slow, deliberate inversion for complete recovery. Ten inversions should take at least 30 seconds. One inversion equals turning the vial upside down, then returning it to an upright position.*



10. TIMER ENTER입력.

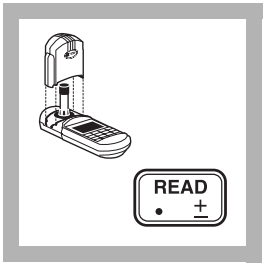
3분간 반응시간이 표시된다.

Note: *A pink color will develop if chlorine is present.*



11. 타이머가 울리면 바이알을 닦아서 아답타에 끼운다.

Note: *Do not move the vial from side to side as this can cause errors.*



12. 바이알 위로 기기 덮개를 덮어준다.

READ키를 누른다.

결과치가 mg/L total chlorine 로 표시된다.

REQUIRED REAGENTS

Description	Quantity Required Per Test	Unit	Cat. No.
Test 'N Tube DPD Total Chlorine Reagent	1 vial	25/pkg	21056-25
Test 'N Tube Vials	1 vial	6/pkg	22758-06

REQUIRED APPARATUS

COD/TNT Adapter, DR/800	1	each	48464-00

OPTIONAL REAGENTS

Chlorine Standard Solution, 2-mL PourRite ampule, 50-75 mg/L		20/pkg	14268-20
Potassium Iodide Solution, 30 g/L		100 mL* MDB	343-32
Sodium Arsenite Solution, 5 g/L		100 mL* MDB	1047-32
Sodium Hydroxide Standard Solution, 1.00 N		100 mL* MDB	1045-32
Sulfuric Acid Standard Solution, 1.000 N		100 mL* MDB	1270-32

OPTIONAL APPARATUS

Beaker, 50 mL		each	500-41H
PourRite Ampule Breaker		each	24846-00
pH Indicator Paper, pH 1 to 11		5 rolls/pkg	391-33
pH Meter, *sension*™*1*, portable, with electrode		each	51700-10
Pipet, TenSette, 0.1 to 1.0 mL		each	19700-01
Pipet Tips, for 19700-01 TenSette Pipet		50/pkg	21856-96
Pipet Tips, for 19700-01 TenSette Pipet		1000/pkg	21856-28
Test Tube Rack		each	18641-00

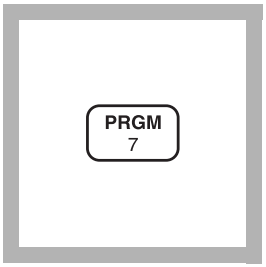
* Marked Dropper Bottle - contact Hach for larger sizes.

CHROMIUM, HEXAVALENT (0 to 0.60 mg/L Cr^{6+}) For water and wastewater

1,5-Diphenylcarbohydrazide Method* (Powder Pillows or AccuVac Ampuls)

USEPA accepted for wastewater analyses**

Using Powder Pillows

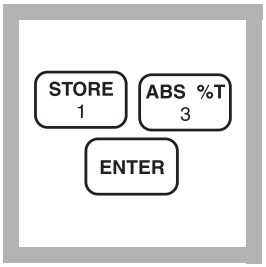


1. hexavalent chromium (Cr6+)-의 powder pillows 방식 측정을 위해 번호를 선택한다.

Press: **PRGM**

The display will show:

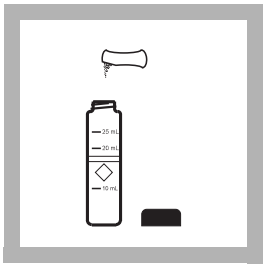
PRGM ?



2. 13번을 선택하고 **ENTER**입력. 화면에 **mg/L, Cr6** 와 **ZERO** 아이콘 표시**.**

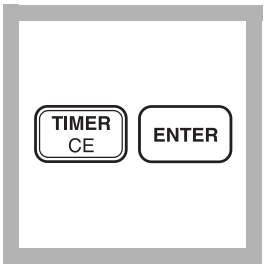
Note: *For alternate forms (CrO_4, Cr_2O_7), press the* **CONC** *key.*

3. 샘플 셀에 샘플을 10mL 채워 넣는다.



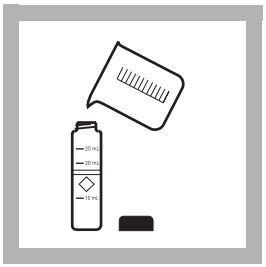
4. ChromaVer 3 Reagent Powder Pillow 의 내용물을 셀에 넣는다.(prepared sample). 셀을 수차례 뒤집어서 섞어준다.

Note: *A purple color will form if Cr^{6+} is present.*



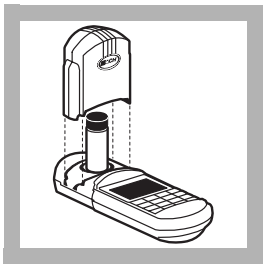
5. TIMER ENTER 입력.

5분간 반응시간이 표시된다.

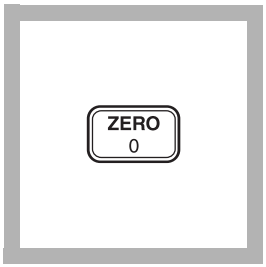


6. 다른 샘플셀에 샘플 10mL을 채운다. (the blank).

Note: *For turbid samples, add the contents of one Acid Reagent Powder Pillow. This ensures turbidity dissolved by the acid in the ChromaVer 3 Chromium Reagent is also dissolved in the blank.*



7. 타이머가 울리면 blank를 셀 홀더에 넣고 기기 덮개를 덮어준다.



8. ZERO키를 누른다.

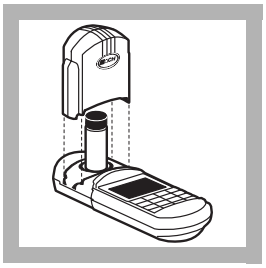
화면에 다음과 같이 표시된다:

0.00 mg/L Cr6

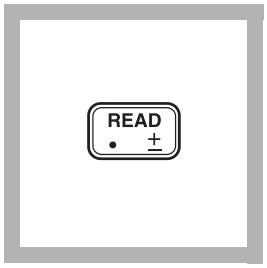
---

* Adapted from *Standard Methods for the Examination of Water and Wastewater*

** Procedure is equivalent to USGS method I-1230-85 for wastewater.



9. 측정할 샘플을 셀 홀더에 넣고 기기 덮개를 덮어준다.

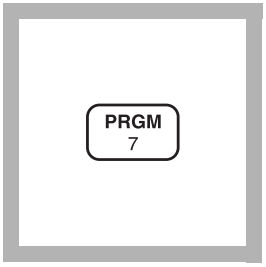


10. **READ**키를 누른다.

결과치가
mg/L hexavalent 로
나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Standard Adjust in Section 1).*

Using Accuvac Ampuls

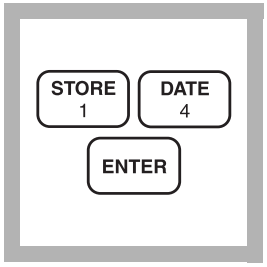


1. hexavalent chromium (Cr6+)- 의 AccuVac Ampuls 방식 측정을 위해 번호를 선택한다.

Press: **PRGM**

The display will show:

PRGM ?

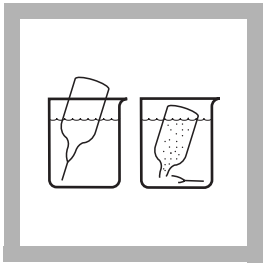


2. **14**번을 선택하고 **ENTER**입력. 화면에 **mg/L, Cr6** 와 **ZERO** 아이콘 표시.

Note: *For alternate forms (CrO_4, Cr_2O_7), press the* **CONC** *key.*

3. 샘플셀에 샘플을 최소 10mL이상 담는다. (the blank).
비커에 최소 40mL 이상 샘플을 채운다.

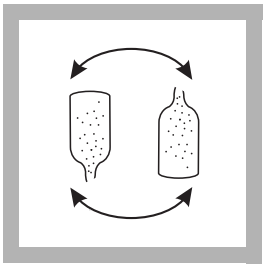
Note: *For turbid samples, add the contents of one Acid Reagent Powder Pillow to 10 mL of the blank. This ensures turbidity dissolved by the acid in the ChromaVer 3 Chromium Reagent is also dissolved in the blank.*



4. ChromaVer 3 Reagent AccuVac Ampul에 샘플을 채운다. (the prepared ample).

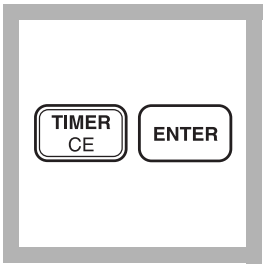
Note: *Keep the tip immersed while the ampul fills completely.*

Note: *ChromaVer 3 should be white to tan in color. Replace if it is brown or green.*



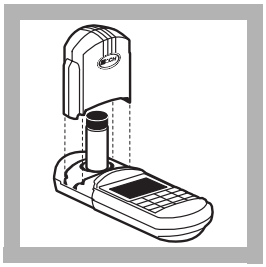
5. ampul을 빠르게 수차례 뒤집어서 섞어 준다. 표면을 깨끗이 닦는다.

Note: *A purple color will form if hexavalent chromium is present.*

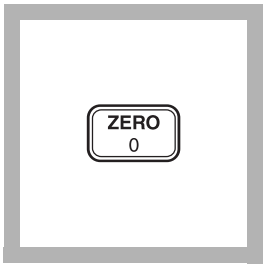


6. TIMER ENTER 입력.

5분간 반응시간이 표시된다.



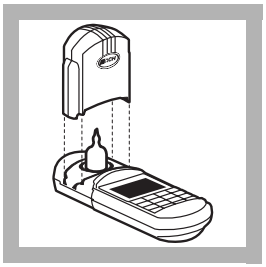
7. 타이머가 울리면 blank를 셀 홀더에 끼운다.



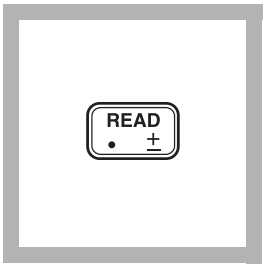
8. ZERO키를 누른다.

화면에 다음과 같이 나타난다:

0.00 mg/L Cr6



9. 측정할 Ampul을 셀 홀더에 넣고 기기 덮개를 덮어준다.



10. READ키를 누른다.

화면에 결과치가 mg/L hexavalent chromium 로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Standard Adjust in Section 1).*

REQUIRED REAGENTS AND APPARATUS (Using Powder Pillows)

Description	Quantity Required Per Test	Unit	Cat. No.
ChromaVer 3 Chromium Reagent Powder Pillows	1 pillow	100/pkg	12710-99
Sample Cell, 10-20-25 mL, w/ cap	2	6/pkg	24019-06

REQUIRED REAGENTS AND APPARATUS (Using AccuVac Ampuls)

ChromaVer 3 AccuVac Ampuls	1 ampul	25/pkg	25050-25
Beaker, 50 mL	1	each	500-41H

OPTIONAL REAGENTS

Description	Unit	Cat. No
Acid Reagent Powder Pillows	100/pkg	2126-99
Chromium, Hexavalent, Standard Solution, 50 mg/L Cr^{6+}	100 mL	810-42
Chromium, Hexavalent, Standard Solution, Voluette Ampule, 12.5 mg/L Cr^{6+}, 10 mL	16/pkg	14256-10
Chromium, Hexavalent, Standard Solution, PourRite Ampule, 5 mg/L Cr^{6+}, 2 mL	20/pkg	26056-20
Water, deionized	4 L	272-56

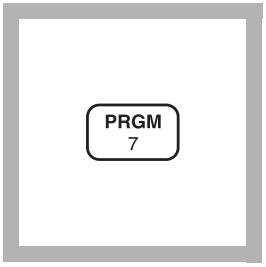
OPTIONAL APPARATUS

Description	Unit	Cat. No.
AccuVac Snapper Kit	each	24052-00
Ampule Breaker Kit	each	21968-00
Flask, volumetric, Class A, 1000 mL	each	14574-53
pH Paper, 1 to 11 pH units	5 rolls/pkg	391-33
pH Meter, EC10, portable	each	50050-00
Pipet, TenSette, 0.1 to 1.0 mL	each	19700-01
Pipet Tips, for 19700-01 TenSette Pipet	50/pkg	21856-96
Pipet Tips, for 19700-01 TenSette Pipet	50/pkg	21856-96
Pipet, volumetric, 5.00 mL, Class A	each	14515-37
Pipet Filler, safety bulb	each	14651-00
PourRite Ampule Breaker, 2 mL	each	24846-00

In the U.S.A.—Call 800-227-4224
Outside the U.S.A.—Contact the Hach office or distributor serving you.

CHROMIUM, TOTAL (0 to 0.60 mg/L)

Alkaline Hypobromite Oxidation Method* **



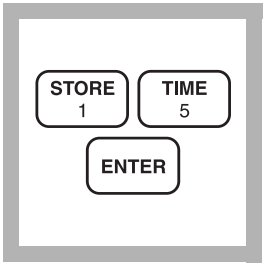
1. Total chromium (Cr) 측정을 위해서 번호를 선택한다.

Press: **PRGM**

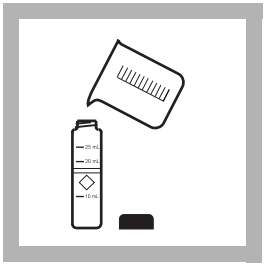
The display will show:

PRGM ?

Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*



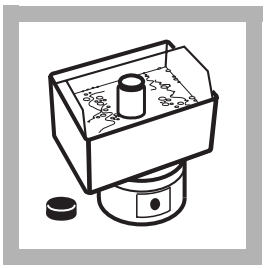
2. 15번을 선택하고 **ENTER**입력. 화면에 **mg/L, Cr** 와 **ZERO** 아이콘 표시.



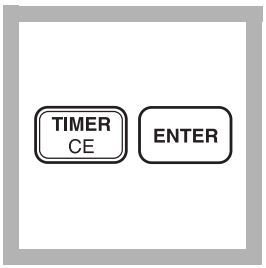
3. 샘플셀에 샘플을 25mL 채운다.

Note: *Adjust the pH of stored samples before analysis.*

4. Chromium 1 Reagent Powder Pillow를 첨가한다. (prepared sample). 마게를 닫고 흔들어서 섞어준 뒤 다시 마게를 연다.

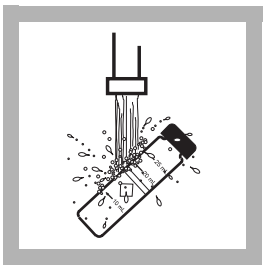


5. Prepared sample을 끓고있는 중탕기에 넣는다.



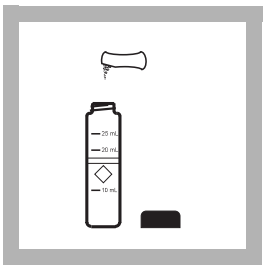
6. TIMER ENTER 입력.

5분간 반응시간이 표시된다.



7. 타이머가 울리면 셀을 중탕기에서 꺼낸다. 마게를 닫고 흐르는 물로 약 25 'C로 냉각시킨다. 마게를 연다.

Note: *Use finger cots to handle the hot sample cell.*



8. Chromium 2 Reagent Powder Pillow를 첨가하고 마게를 닫고 흔들어서 섞어준다. 마게를 다시 연다.

---

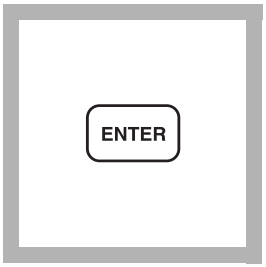
* Adapted from *Standard Methods for the Examination of Water and Wastewater*
** Procedure is equivalent to Standard Method 3500-Cr D for wastewater.

9. Acid Reagent Powder Pillow를 하나 첨가하고 마개를 닫은 후 흔들어 섞어준다.
마개를 다시 연다.

10. ChromaVer 3 Chromium Reagent Powder Pillow를 하나 첨가하고 흔들어 섞어준다.

Note: *A purple color will form if chromium is present.*

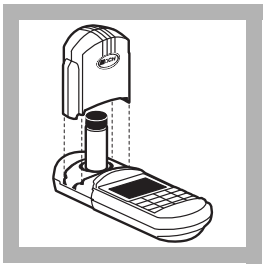
Note: *ChromaVer 3 is white to tan in color. Replace brown or green powder. Undissolved powder does not affect accuracy.*



11. 화면에 다음처럼 표시된다: **05:00 TIMER 2**

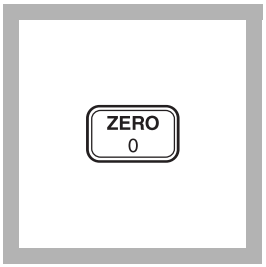
ENTER키를 누른다.

5분간 반응 시간이 표시된다.



12. 타이머가 울린 뒤 다른 샘플셀에 샘플을 25mL 담는다. (the blank) 그 셀을 셀 홀더에 넣고 기기 덮개를 덮어준다.

Note: *For turbid samples, treat the blank as a sample, adding all reagents except the ChromaVer 3.*

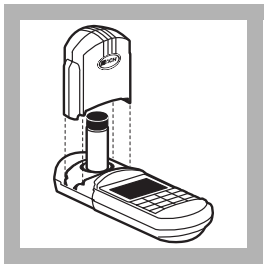


13. **ZERO**키를 누른다.

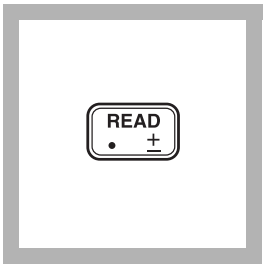
화면에 다음같이 표시된다:

0.00 mg/L Cr

Note: *If Reagent Blank Correction is on, the display may flash "limit". See Section 1.*



14. 측정할 셀을 셀 홀더에 넣고 기기 덮개를 덮는다.



15. **READ**키를 누른다.

화면에 결과치가 mg/L total chromium (Cr)으로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Section 1).*

REQUIRED REAGENTS

	Cat. No.
Total Chromium Reagent Set (100 Tests)	22425-00
Includes: (1) 2126-99, (1) 12066-99, (1) 2043-99, (1) 2044-99	

Description	Quantity Required Per Test	Unit	Cat. No.
Acid Reagent Powder Pillows	1 pillow	100/pkg	2126-99
ChromaVer 3 Chromium Reagent Powder Pillows	1 pillow	100/pkg	12066-99
Chromium 1 Reagent Powder Pillows	1 pillow	100/pkg	2043-99
Chromium 2 Reagent Powder Pillows	1 pillow	100/pkg	2044-99

REQUIRED APPARATUS

Hot plate, 4" diameter, 120 V	1	each	12067-01
OR			
Hot plate, 4" diameter, 240 V	1	each	12067-02
Sample Cell, 10-20-25 mL, w/ cap	2	6/pkg	24019-06
Water bath and rack	1	each	1955-55

OPTIONAL REAGENTS

Chromium, trivalent, Standard Solution, 50 mg/L Cr^{3+}		100 mL	14151-42
Chromium, trivalent, Standard Solution, PourRite ampule, 12.5 mg/L Cr^{3+}, 10 mL		16/pkg	14257-10
Nitric Acid, ACS		500 mL	152-49
Nitric Acid Solution 1:1		500 mL	2540-49
Sodium Hydroxide Standard Solution 5.0 N		50 mL* DB	2450-26
Water, deionized		4 L	272-56

OPTIONAL APPARATUS

Cylinder, graduated, polypropylene, 25 mL		each	1081-40
Finger Cots		2/pkg	14647-02
pH Paper, 1 to 11 pH units		5 rolls/pkg	391-33
pH Meter, sens*ion 1*, with electrode		each	51700-10
Pipet, serological, 2 mL		each	532-36
Pipet, TenSette, 0.1 to 1.0 mL		each	19700-01
Pipet Tips for 19700-01 TenSette Pipet		50/pkg	21856-96
Pipet, volumetric, Class A, 1.00 mL		each	14515-35
Pipet Filler, safety bulb		each	14651-00
Ampule Breaker, 10-mL		each	21968-00

For Technical Assistance, Price and Ordering

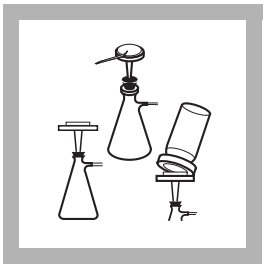
In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

* Contact Hach for larger sizes.

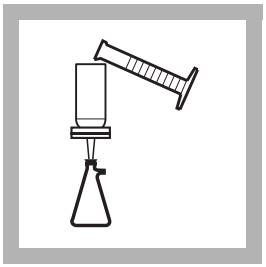
COLOR, TRUE AND APPARENT (0 to 500 units)

APHA Platinum-Cobalt Standard Method* For water, wastewater and seawater

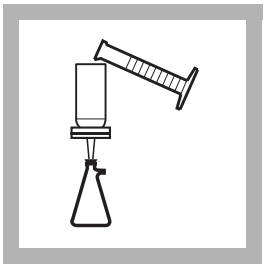


1. 여과장치를 조립한다.
(membrane filter, filter holder, filter flask, and aspirator).

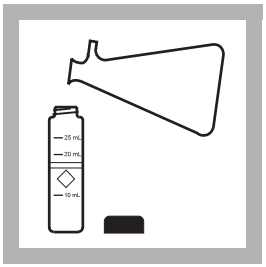
Note: *To test for apparent color, do not filter; begin at Step 4 and skip Step 7.*



2. 필터에 증류수를 50mL가량 부어서 세척해 준다.
세척한 물은 버린다.

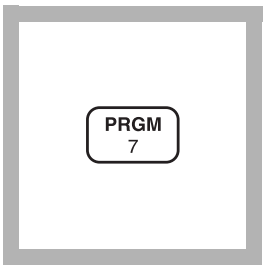


3. 다시 50mL를 필터에 붓는다. 이번엔 버리지 않는다.



4. 걸러진 증류수 25mL를 샘플셀에 남는다.
(the blank)
남은 양은 버린다.

Note: *For apparent color use unfiltered deionized water.*

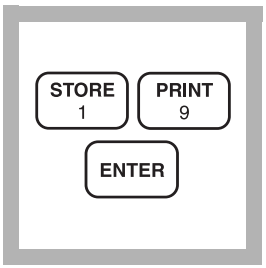


5. APHA color를 측정하기 위해 번호를 선택한다.

Press: **PRGM**

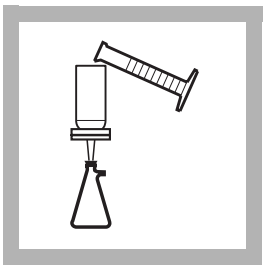
The display will show:

PRGM ?

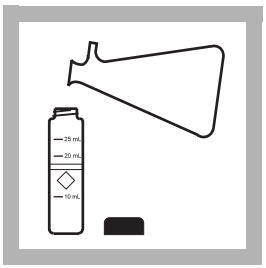


6. **19**번을 선택하고

ENTER입력. 화면에 **PtCo** 와 **ZERO** 아이콘이 표시된다**.**



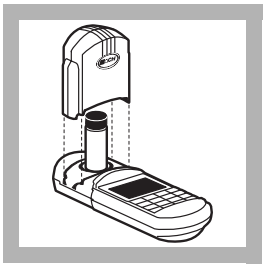
7. 50mL의 샘플을 필터에 붓는다.



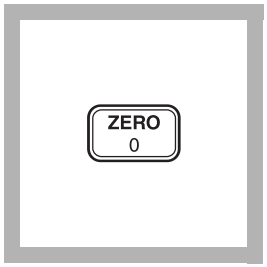
8. 걸러진 샘플을 두번째 샘플셀에 25mL 붓는다.
(the prepared sample)

---

* Adapted from *Standard Methods for the Examination of Water and Wastewater*



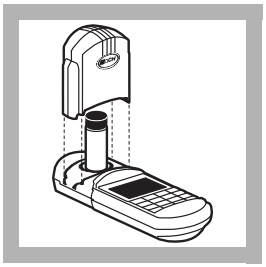
9. blank를 셀 홀더에 넣고 기기 덮개를 덮어 준다.



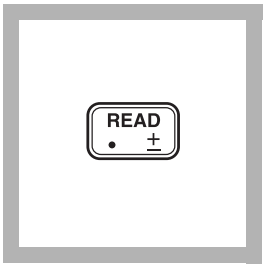
10. **ZERO**키를 누른다.

화면에 다음과 같이 나타난다:

0 mg/L Pt Co



11. prepared sample을 셀 홀더에 넣고 기기 덮개를 덮어준다.



12. **READ**키를 누른다.

화면에 결과치가 Platinum-Cobalt color units (Pt-Co) 으로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Standard Adjust in Section 1).*

REQUIRED REAGENTS

Description	Quantity Required Per Test	Units	Cat. No.
Water, deionized	50 mL	4 L	272-56

REQUIRED APPARATUS

Aspirator, vacuum	1	each	2131-00
Filter Holder, 47 mm, 300 mL graduated	1	each	13529-00
Filter, membrane, 47 mm, 0.45 microns	1	100/pkg	13530-00
Flask, filtering, 500 mL	1	each	546-49
Sample Cell, 10-20-25 mL, w/cap	2	6/pkg	24019-06
Stopper, No. 7, one hole	1	6/pkg	2119-07

OPTIONAL REAGENTS

Color Standard Solution, 500 platinum-cobalt units	1 L	1414-53

OPTIONAL APPARATUS

Cylinder, graduated, 50-mL, glass	each	508-41
Flask, volumetric, Class A, 100 mL	each	14574-42
Pipet, volumetric, Class A, 50 mL	each	14515-41
Thermometer, –20 to 110 °C, non-mercury	each	26357-02

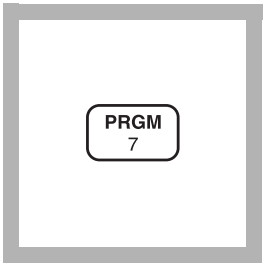
For Technical Assistance, Price and Ordering

In the U.S.A.—Call 800-227-4224
Outside the U.S.A.—Contact the Hach office or distributor serving you.

COPPER (0 to 5.00 mg/L)

For water, wastewater and seawater*

Bicinchoninate Method** (Powder Pillows or AccuVac Ampuls); USEPA approved for reporting wastewater analysis (digestion needed; See Section 2)*** Using Powder Pillows



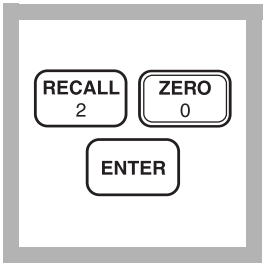
1. Bicinchoninate copper (Cu)의 powder pillows 방식 측정을 위해 번호를 선택한다 .

Press: **PRGM**

The display will show:

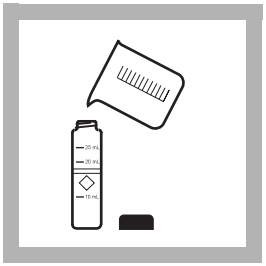
PRGM ?

Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*



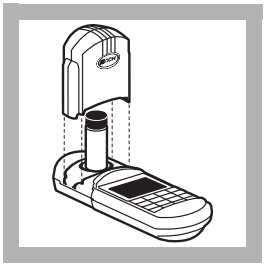
2. 20번을 선택하고 **ENTER**입력. 화면에 **mg/L, Cu** 와 **ZERO** 아이콘 표시**.**

Note: *Determination of total copper needs a prior digestion (see Digestion in Section 2).*



3. 샘플셀에 샘플을 10mL 담는다. (the blank).

Note: *Adjust the pH of acid-preserved samples to 4-6 with 8 N KOH before analysis. Do not exceed pH 6 or copper may precipitate.*



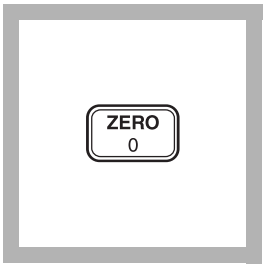
4. blank를 셀 홀더에 끼우고 기기 덮개를 덮어준다.

---

* Pretreatment required; see *Interferences (Using Powder Pillows)*

** Adapted from Nakano, S., *Yakugaku Zasshi*, 82 486-491 (1962) [*Chemical Abstracts*, 58 3390e (1963)]

*** Powder Pillows only: *Federal Register*, 45 (105) 36166 (May 29, 1980)



5. ZERO키를 누른다.

화면에 다음과 같이 나타난다:

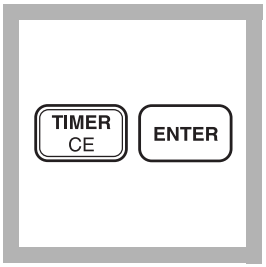
0.00 mg/L Cu

Note: *If Reagent Blank Correction is on, the display may flash "limit".*

6. 다른 샘플셀에 샘플 10mL를 채운다.

7. CuVer 1 Copper Reagent Powder Pillow 를 하나 샘플셀에 넣고 휘저어 섞어준다. (the prepared sample).

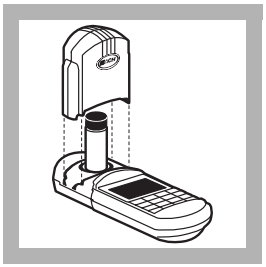
Note: *If copper is present, A purple color will develop.*



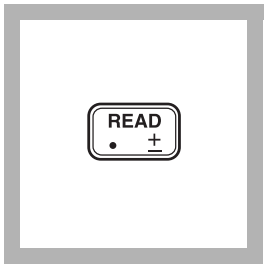
8. TIMER ENTER 입력.

2분간 반응시간이 표시된다.

Note: *Accuracy is not affected by undissolved powder.*



9. 타이머가 울린 후 30분 안에 측정 할 샘플을 셀 홀더에 넣고 기기 덮개를 덮어준다.



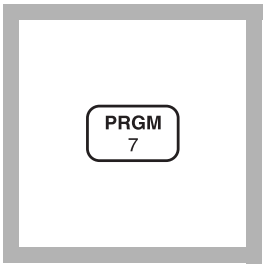
10. READ키를 누른다.

결과치가 mg/L copper로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Section 1).*

Using AccuVac Ampuls

Method 8026



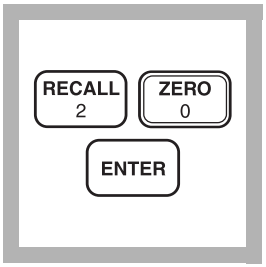
1. bicinchoninate copper (Cu)의 AccuVac ampuls방식 측정을 위해 번호를 선택한다.

Press: **PRGM**

The display will show:

PRGM ?

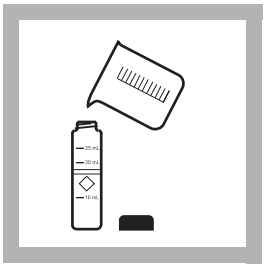
Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*



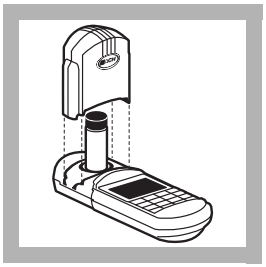
2. 20번을 선택하고 **ENTER**입력. 화면에 **mg/L, Cu** 와 **ZERO** 아이콘 표시**.**

Note: *Determination of total copper needs a prior digestion (see Digestion in Section 2).*

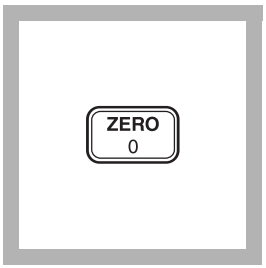
Note: *Adjust the pH of stored samples before analysis.*



3. 샘플셀에 샘플을 최소 10mL이상 채운다. (the blank).
비커에 최소 40 mL 이상 샘플을 채운다.



4. blank를 셀 홀더에 끼우고 기기 덮개를 덮어준다.

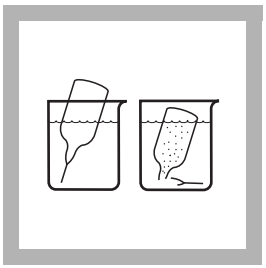


5. ZERO키를 누른다.

화면에 다음과 같이 나타난다:

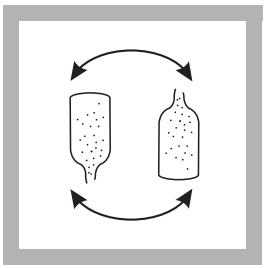
0.00 mg/L Cu

Note: *If Reagent Blank Correction is on, the display may flash "limit".*



6. CuVer 2 Copper Reagent AccuVac Ampul에 샘플을 채운다.

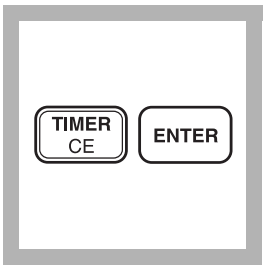
Note: *Keep the tip immersed while the ampul fills completely.*



7. ampul을 빠르게 수차례 뒤집어서 섞어준다. 표면을 깨끗이 닦아준다.

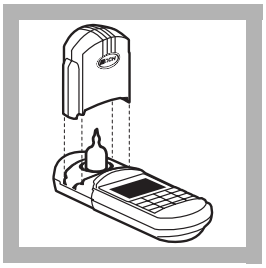
Note: *A purple color will form if copper is present.*

Note: *Accuracy is not affected by undissolved powder*



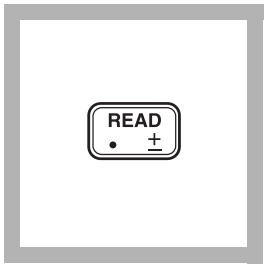
8. TIMER ENTER 입력.

2분간 반응 시간이 표시된다.



9. 타이머가 울린 후 AccuVac ampul을 셀 홀더에 끼우고 기기 덮개를 덮는다.

Note: *Step 10 must be completed within 30 minutes after the timer beeps.*



10. READ키를 누른다.

화면에 결과치가 mg/L copper (Cu)로 표시된다.

Note: *Standard Adjust may be performed using a prepared standard (see in Section 1).*

REQUIRED REAGENTS & APPARATUS (Using Powder Pillows)

Description	Quantity Required Per Test	Unit	Cat. No.
CuVer 1 Copper Reagent Powder Pillows	1 pillow	100/pkg	21058-69
Sample Cell, 10-20-25 mL, w/cap	2	6/pkg	24019-06

REQUIRED REAGENTS & APPARATUS (Using AccuVac Ampuls)

CuVer 2 Copper Reagent AccuVac Ampuls	1 ampul	25/pkg	25040-25
Beaker, 50 mL	1	each	500-41H

OPTIONAL REAGENTS

Copper Standard Solution, 100 mg/L		100 mL	128-42
Copper Standard Solution, Voluette Ampule, 75 mg/L Cu, 10 mL		16/pkg	14247-10
CuVer 2 Reagent Powder Pillows		100/pkg	21882-99
Formaldehyde, 37%, ACS		100 mL* MDB	2059-32
Free Copper Reagent Powder Pillows		100/pkg	21186-69
Hydrochloric Acid Solution, 6.0 N		500 mL	884-49
Hydrosulfite Reagent Powder Pillows		100/pkg	21188-69
Metals Drinking Water Standard, LR for Cu, Fe, Mn		500 mL	28337-49
Metals Drinking Water Standard, HR for Cu, Fe, Mn		500 mL	28336-49
Nitric Acid, ACS		500 mL	152-49
Nitric Acid Solution, 1:1		500 mL	2540-49
Potassium Chloride Solution, saturated		100 mL	765-42
Potassium Hydroxide Standard Solution, 8.0 N		100 mL* MDB	282-32H
Sodium Hydroxide Standard Solution, 5.0 N		100 mL* MDB	2450-32
Water, deionized		4 L	272-56

OPTIONAL APPARATUS

Description	Unit	Cat. No.
AccuVac Snapper Kit	each	24052-00
Ampule Breaker Kit	each	21968-00
Cylinder, graduated, mixing, 25 mL	each	20886-40
Cylinder, graduated, polypropylene, 25 mL	each	1081-40
Cylinder, graduated, 100 mL	each	508-42
Filter Paper, folded, 12.5 cm	100/pkg	1894-57
Filter Pump	each	2131-00
Flask, volumetric, 100 mL, Class A	each	14547-42
Funnel, polypropylene, 65 mm	each	1083-67
Hot Plate, 4" diameter, 120 V	each	12067-01
Hot Plate, 4" diameter, 240 V	each	12067-02
pH Indicator Paper, 1 to 11 pH	5 rolls/pkg	391-33
pH Meter, sens*ion 1*, with electrode	each	51700-10
Pipet, TenSette, 0.1 to 1.0 mL	each	19700-01

* Contact Hach for larger sizes.

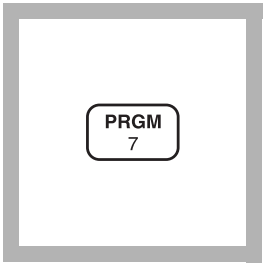
Pipet Tips, for 19700-01 TenSette Pipet 50/pkg 21856-96
Pipet Tips, for 19700-01 TenSette Pipet 1000/pkg 21856-28
Pipet, volumetric, Class A, 1.00 mL .....each 14515-35
Pipet Filler, safety bulb .....each 14651-00

For Technical Assistance, Price and Ordering

In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

Porphyrin Method*

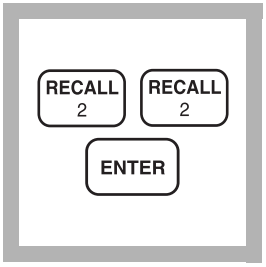


1. Copper (Cu)의 porphyrin method 측정을 위해서 번호를 선택한다.

Press: **PRGM**

The display will show:

PRGM ?



2. 22번을 선택하고 **ENTER**입력. 화면에 **µg/L, Cu** 와 **ZERO** 아이콘 표시**.**

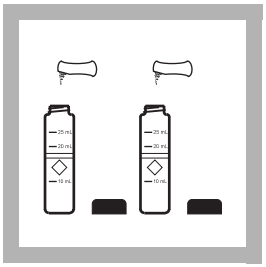
Note: *Total copper determination needs a prior digestion; use either the Digesdahl or vigorous digestion (Section 2).*

3. 샘플셀 두개에 각각 10mL씩 샘플을 채운다.

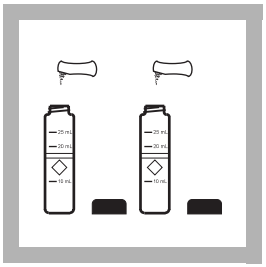
Note: *Wash all glassware with detergent. Rinse with tap water. Rinse again with Nitric Acid Solution, 1:1. Rinse a third time with copper-free, deionized water.*

4. Copper Masking Reagent Powder Pillow 를 한개의 샘플셀에 넣어서 섞어준다. (the blank).

Note: *The other sample cell is the prepared sample.*

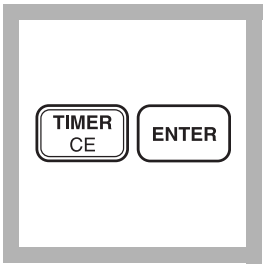


5. Porphyrin 1 Reagent Powder Pillow를 각 샘플셀에 넣고 휘저어 용해 시켜준다.



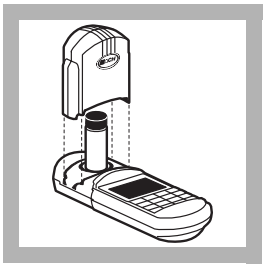
6. Porphyrin 2 Reagent Powder Pillow를 각 샘플셀에 넣고 휘저어 용해 시켜준다.

Note: *The yellow color will turn blue momentarily. If any copper is present, the yellow color will return.*



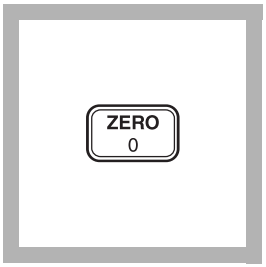
7. TIMER ENTER

3분간 반응시간이 표시된다.



8. 타이머가 울린 후 blank를 셀 홀더에 넣고 기기 덮개를 덮어준다.

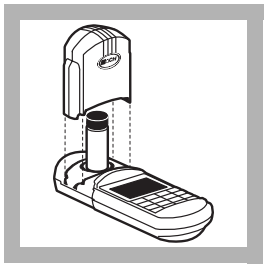
* Adapted from Ishii and Koh, *Bunseki Kagaku*, 28 473 (1979)



9. ZERO키를 누른다.

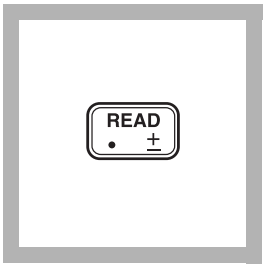
화면에 다음과 같이 표시된다:

0.0 µg/L Cu



10. 측정할 샘플을 셀 홀더에 끼우고 기기 덮개를 덮는다.

Note: *If samples with high levels of metal are analyzed, a slight metallic deposit or yellow buildup may appear on the sample cell wall. Remove by rinsing with nitric acid. Dilute a fresh sample and repeat the test. Multiply the result by the dilution factor; see Section 1.*



11. READ키를 누른다. .

화면에 결과치가 µg/L copper (Cu)로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Standard Adjust in Section 1).*

REQUIRED REAGENTS

	Cat. No.
Copper Reagent Set, 10-mL samples (100 tests)	26033-00
Includes: (1) 26034-49, (2) 26035-49, (2) 26036-49	

Description	Quantity Required Per Test	Unit	Cat. No.
Copper Masking Reagent Powder Pillows	1 pillow	100/pkg	26034-49
Porphyrin 1 Reagent Powder Pillows	2 pillows	100/pkg	26035-49
Porphyrin 2 Reagent Powder Pillows	2 pillows	100/pkg	26036-49

REQUIRED APPARATUS

Sample Cell, 10-20-25 mL, w/ caps	2	6/pkg	24019-06

OPTIONAL REAGENTS

Copper Standard Solution, 10 mg/L Cu	100 mL	128-42
Hydrochloric Acid Solution, 1:1 (6 N)	500 mL	884-49
Nitric Acid, ACS	500 mL	152-49
Nitric Acid Solution, 1:1	500 mL	2540-49
Sodium Hydroxide Standard Solution, 5 N	1 L	2450-53
Water, deionized	4 L	272-56

OPTIONAL APPARATUS

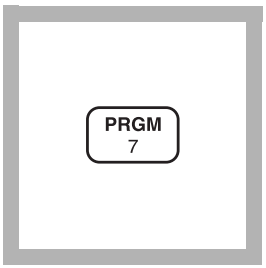
Beaker, 100 mL	each	500-42H
Cylinder, mixing, graduated, 25 mL	each	20886-40
Flask, volumetric, Class A, 100 mL	each	14574-42
Hot Plate, 7 x 7 inches, 120 V	each	23441-00
Hot Plate, 7 x 7 inches, 240 V	each	23441-02
pH Paper, 1 to 11 pH units	5 rolls/pkg	391-33
pH Meter, *sension*™*1*, portable, with electrode	each	51700-10
Pipet, Mohr, 5 mL	each	20934-37
Pipet, TenSette, 0.1 to 1.0 mL	each	19700-01
Pipet Tips, for 19700-01	50/pkg	21856-96
Pipet Tips, for 19700-01	1000/pkg	21856-28
Pipet, volumetric, 1.0 mL, Class A	each	14515-35
Pipet Filler, safety bulb	each	14651-00
Watch Glass, Pyrex®, 100 mL	each	578-70

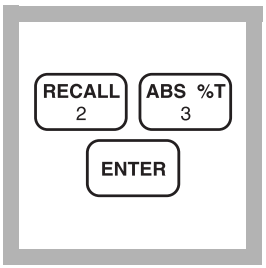
For Technical Assistance, Price and Ordering

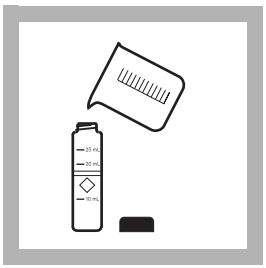
In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

Pyridine-Pyrazalone Method*







1. cyanide (CN)측정을 위해서 번호를 선택한다.

Press: **PRGM**

The display will show:

PRGM ?

Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*

2. **23**번을 선택하고 **ENTER**입력. 화면에 **mg/L, CN** 과 **ZERO** 아이콘 표시**.**

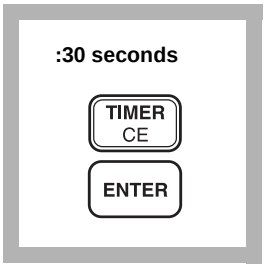
Note: *Adjust the pH of stored samples before analysis.*

3. 샘플셀에 샘플을 10mL채운다.

Note: *Samples at less than 23 °C require a longer reaction time and samples at greater than 25 °C give low test results. Sample temperature must be 23-25 °C.*

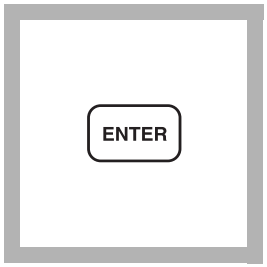
4. CyaniVer 3 Cyanide Reagent Powder Pillow를 첨가하고 마개를 닫는다.

* Adapted from Epstein, Joseph, *Anal. Chem*. 19 (4), 272 (1947)



5. **TIMER ENTER** 입력.

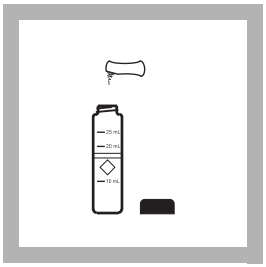
30초간 반응 시간이 시작된다 30초간 샘플셀을 흔들어준다.



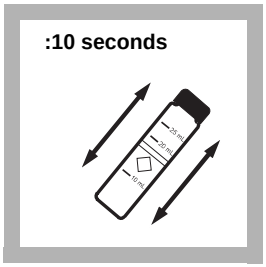
6. 첫번째 타이머가 끝나면 다음과 같이 나타난다: **0:30 TIMER 2**

ENTER키를 누른다.

30초간 반응 시간이 표시된다. 샘플셀을 안정적인 곳이 둔다.



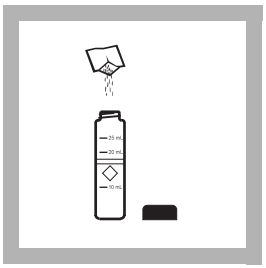
7. 타이머가 울린 후, CyaniVer 4 Cyanide Reagent Powder Pillow를 하나 첨가하고 마개를 닫는다.



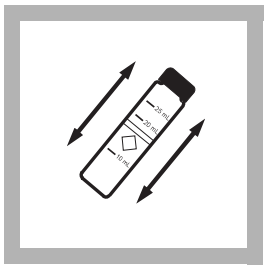
8. 샘플셀을 10초간 흔들어준다.
즉시 다음 단계로 넘어간다.

Note: *Delaying the addition of the CyaniVer 5 Cyanide Reagent Powder for more than 30 seconds after the addition of the CyaniVer 4 Cyanide Reagent Powder will give lower test results.*

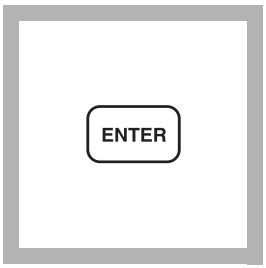
Note: *Accuracy is not affected by undissolved CyaniVer 4 Cyanide Reagent Powder.*



9. CyaniVer 5 Cyanide Reagent Powder Pillow를 하나 첨가하고 마개를 닫는다.



10. 파우더를 완전히 녹이기 위해서 강하게 흔들어 준다.
(the prepared sample)



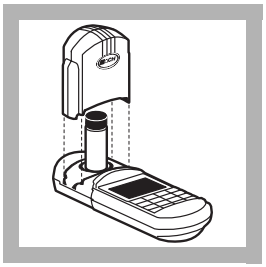
11. 화면에 다음처럼 나타난다: **30:00 Timer 3**

ENTER를 누른다.

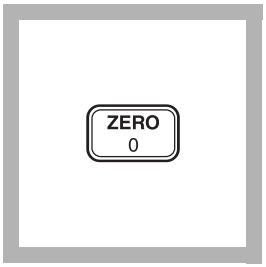
30분간 반응시간이 표시된다.

Note: *If cyanide is present, a pink color will develop which then turns blue after a few minutes.*

12. 다른 샘플 셀에 샘플 10mL를 채운다.
(the blank)



13. blank를 셀홀더에 넣고 기기 덮개를 덮어준다.

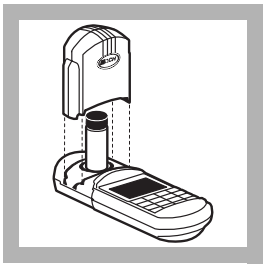


14. ZERO키를 누른다.

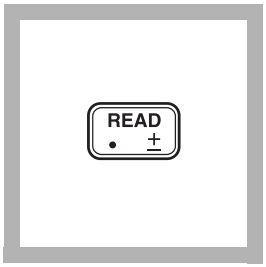
화면에 다음과 같이 나타난다:

0.000 mg/L CN

Note: *If Reagent Blank Correction is on, the display may flash "limit". See Section 1.*



15. 측정할 샘플을 셀 홀더에 넣고 기기 덮개를 덮어준다.



16. READ키를 누른다.

화면에 결과치가 mg/L cyanide (CN)로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Section 1).*

REQUIRED REAGENTS

	Cat. No.
Cyanide Reagent Set (100 Tests), 10 mL samples	24302-00
Includes: (1) 21068-69, (1) 21069-69, (1) 21070-69	

Description	Quantity Required Per Test	Unit	Cat. No.
CyaniVer 3 Cyanide Reagent Powder Pillows	1 pillow	100/pkg	21068-69
CyaniVer 4 Cyanide Reagent Powder Pillows	1 pillow	100/pkg	21069-69
CyaniVer 5 Cyanide Reagent Powder Pillows	1 pillow	100/pkg	21070-69

REQUIRED APPARATUS

Sample Cell, 10-20-25, w/cap	2	6/pkg	24019-06

OPTIONAL REAGENTS

Description	Unit	Cat. No.
Acetic Acid, Glacial	500 mL	100-49
Ascorbic Acid	100 g	6138-26
Bromine Water	25 mL	2211-20
Buffer Solution, pH 4.0	500 mL	12223-49
Hexanes, ACS	500 mL	14478-49
HexaVer Chelating Reagent Powder Pillows	100/pkg	243-99
Hydrochloric Acid Standard Solution, 2.5 N	100 mL MDB	1418-32
Magnesium Chloride Solution	1 L	14762-53
m-Nitrophenol Indicator	100 mL MDB	2476-32
Potassium Iodide Solution, 30 g/L	100 mL MDB	343-32
Sodium Arsenite Solution, APHA	100 mL MDB	1047-32
Potassium Cyanide, ACS	28 g	767-14
Sodium Hydroxide Standard Solution, 0.25 N	1 L	14763-53
Sodium Hydroxide Standard Solution, 5.0 N	1 L	2450-53
Starch Indicator Solution	10 mL MDB	349-32
Sulfuric Acid Standard Solution, 19.2 N	500 mL	2038-49
Water, deionized	4 L	272-56

OPTIONAL APPARATUS

Description	Unit	Cat. No.
Beaker, glass, 600 mL	each	500-52
Bottle, wash, 500 mL	each	620-11
Cylinder, graduated, 50 mL	each	508-41
Cylinder, graduated, 250 mL	each	508-46
Distillation Apparatus, cyanide accessories	each	22658-00
Distillation Apparatus, general purpose accessories	each	22653-00
Distillation Apparatus Heater and Support Apparatus, 115 Vac, 60 Hz	each	22744-00
Distillation Apparatus Heater and Support Apparatus, 230 Vac, 50 Hz	each	22744-02
Dropper, plastic	each	6080-00
Filter Paper, folded, 12.5 cm	100/pkg	1894-57
Flask, volumetric, Class A, 1000 mL	each	14574-53
Flask, volumetric, Class A, 250 mL	each	14574-46
Funnel, poly, 65 mm	each	1083-67
Funnel, separatory, 500 mL	each	520-49
Hydrogen Sulfide Test Papers	100/pkg	25377-33
pH Meter, *sension*™*1*, portable	each	51700-10
Pipet, volumetric, Class A, 1.00 mL	each	14515-35
Pipet Filler, safety bulb	each	14651-00
Scoop, double ended	each	12257-00
Spoon, measuring, 1.0 g	each	510-00
Support Ring, 4 inch	each	580-01
Support Stand	each	563-00
Thermometer, –20 to 110 °C, non-mercury	each	26357-02

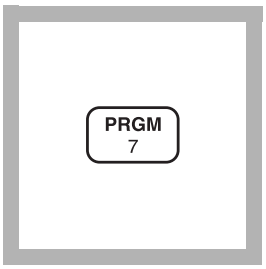
For Technical Assistance, Price and Ordering

In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

CYANURIC ACID (7 to 55 mg/L)

Turbidimetric Method



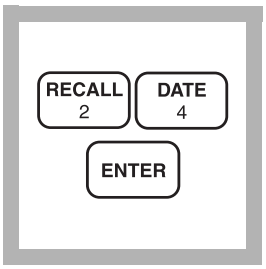
1. Cyanuric acid를 측정하기 위해서 프로그램 번호를 선택한다.

Press: **PRGM**

The display will show:

PRGM ?

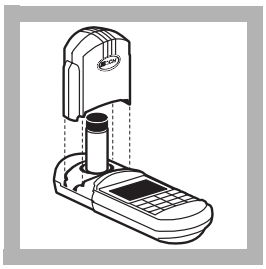
Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*



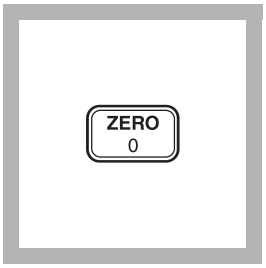
2. **24**번을 선택하고 **ENTER**입력. 화면에 **mg/L, CYACD** 와 **ZERO** 아이콘 표시.

3. 샘플셀에 샘플을 25mL 채운다. (the blank).

Note: *Filtering is required for highly turbid samples.*



4. blank를 셀 홀더에 끼우고 기기 덮개를 덮는다.

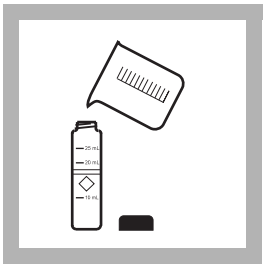


5. **ZERO**키를 누른다.

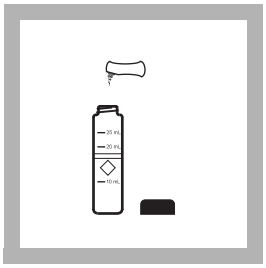
화면에 다음과 같이 나타난다:

0 mg/L CYACD

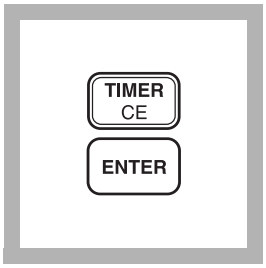
Note: *If Reagent Blank Correction is on, the display may flash "limit". See Section 1.*



6. 다른 샘플셀에 샘플 25mL를 채운다.



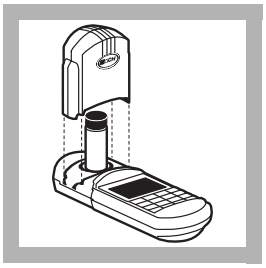
7. Cyanuric Acid 2 Reagent Powder Pillow를 첨가하고 저어서 섞어준다. (the prepared sample)



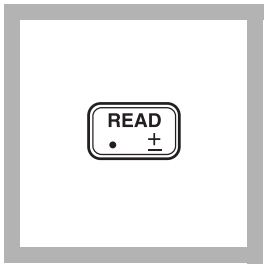
8. **TIMER ENTER** 입력. 3분간 반응 시간이 시작된다.

Note: *A white turbidity will form if cyanuric acid is present.*

Note: *Accuracy is not affected by undissolved powder.*



9. 측정할 샘플을 셀 홀더에 넣고 기기 덮개를 덮어준다.



10. READ키를 누른다.

화면에 결과치가 mg/L cyanuric acid로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Section 1).*

Note: *Clean sample cells with soap, water and a brush soon after each test to prevent a white film from forming.*

REQUIRED REAGENTS AND APPARATUS

Description	Quantity Required Per Test	Unit	Cat. No.
Cyanuric Acid 2 Reagent Powder Pillow	1 pillow	50/pkg	2460-66
Sample Cell, 10-20-25 mL, w/cap	2	6/pkg	24019-06

OPTIONAL REAGENTS

Cyanuric Acid	25 g	7129-24
Water, deionized	4 L	272-56

OPTIONAL APPARATUS

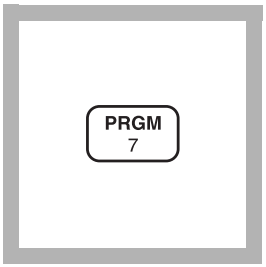
Balance, Acculab UI Series	each	26947-00
Filter Paper, folded 12.5 cm	100/pkg	1894-57
Flask, volumetric, Class A, 100 mL	each	14574-42
Flask, volumetric, Class A, 1000 mL	each	14574-53
Funnel, poly, 65 mm	each	1083-67
Pipet, Bulb	each	14651-00
Pipet, volumetric, Class A, 2.00 mL	each	14515-36

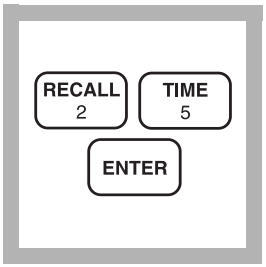
For Technical Assistance, Price and Ordering

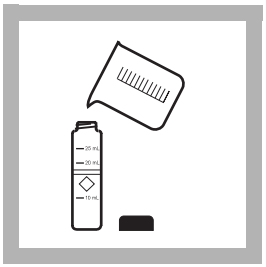
In the U.S.A.—Call 800-227-4224

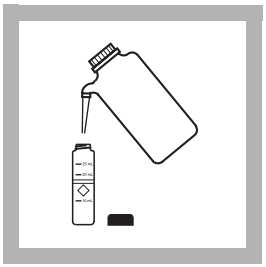
Outside the U.S.A.—Contact the Hach office or distributor serving you.

Iron Reduction Method for Oxygen Scavengers*









1. Diethylhydroxylamine (DEHA)를 측정하기 위해서 프로그램 번호를 선택한다.

Press: **PRGM**

The display will show:

PRGM ?

Note: *To determine other oxygen scavengers, multiply the result by the appropriate factor. See* Other Oxygen Scavengers *following these steps.*

2. 25번을 선택하고 **ENTER**입력. 화면에 **µg/L, DEHA** 와 **ZERO** 아이콘 표시.

Note: *To prevent contamination from iron deposits, rinse sampling containers and sample cells with 1:1 Hydrochloric Acid Solution. Follow with several rinsings of deionized water.*

Note: *Samples must be analyzed immediately.*

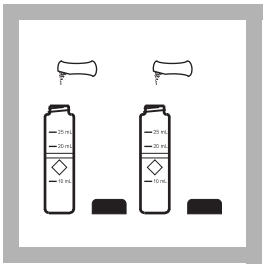
3. 샘플셀에 샘플을 25mL채운다. (the prepared sample).

Note: *The sample temperature should be 25 ±3°C (77 ±5 °F).*

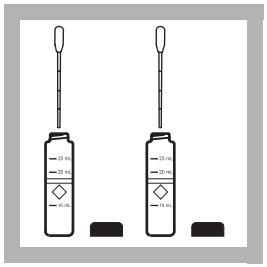
Note: *When testing for compounds that react quickly with oxygen at room temperature, stopper the cell containing the sample in Steps 5–11.*

4. 두번째 샘플셀에 증류수를 25mL 채운다. (the blank)

* Adapted from Ishii and Koh, *Buneseki Kagaku*, 28 473 (1979)

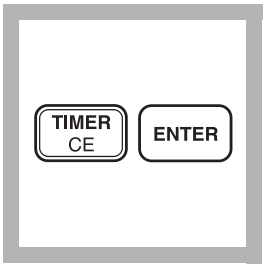


5. DEHA Reagent 1 Powder Pillow를 각 샘플셀에 넣고 마개를 닫은 후 저어서 섞어 준다.



6. 정확히 0.5 mL의 DEHA Reagent 2 Solution을 각 샘플셀에 넣고 저어서 섞어준다. 샘플셀을 음지에 둔다.

Note: *A purple color will slowly develop if DEHA is present.*



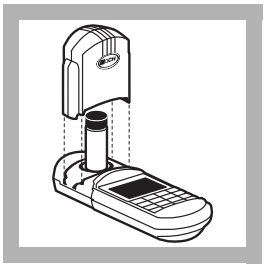
7. 즉시 다음을 누른다.

TIMER ENTER

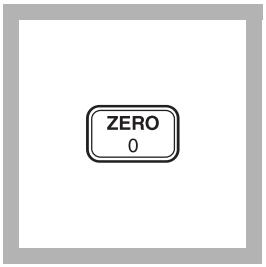
10분간 반응 시간이 표시된다. 측정 대상이 hydroquinone이라면 반응시간은 2분이다.

Note: *Both sample cells must remain in the dark for the entire reaction period.*

Note: *Temperature and reaction time affect results.*



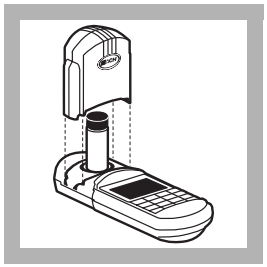
8. 타이머가 울리면 즉시 blank를 셀 홀더에 넣고 기기 덮개를 덮는다.



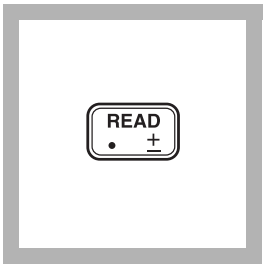
9. **ZERO**키를 누른다.

화면에 다음과 같이 나타난다:

0 µg/L DEHA



10. 즉시 측정할 샘플을 셀 홀더에 넣고 기기 덮개를 덮는다.



11. **READ**키를 누른다.

화면에 결과치가 µg/L DEHA로 나타난다.

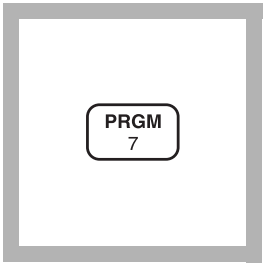
Note: *If the display flashes "limit" it is due to high DEHA levels. Dilute a fresh sample with deoxygenated deionized water and repeat the test. Multiply the result by the dilution factor; see Section 1.*

Ferrous Iron Adjustment

Note: *Repeat the above procedure, but do not add DEHA Reagent 2 (Step 6) to determine the ferrous iron content in the sample. Then press SETUP, scroll to "BLANK" and press* **ENTER**. *The display will show; "BLANK?" Enter the blank value just read. Press* **ENTER** *to accept the value as the blank to be subtracted from each reading.*

SPADNS Method* (Reagent Solution or AccuVac Ampuls)

Using SPADNS Reagent Solution

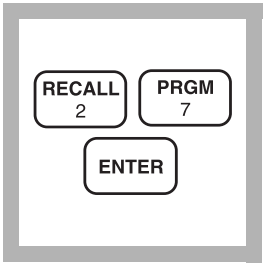


1. Fluoride(F)의 powder pillows방식 측정을 위해 번호를 선택한다.

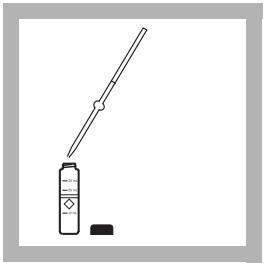
Press: **PRGM**

The display will show:

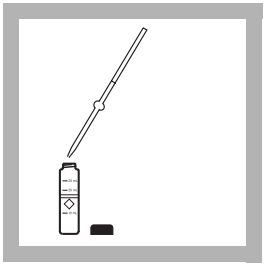
PRGM ?



2. 27번을 선택하고 **ENTER**입력. 화면에 **mg/L, F** 와 **ZERO** 아이콘이 표시.

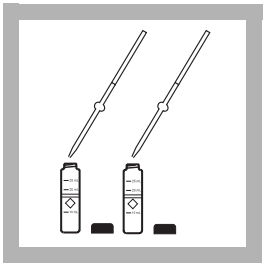


3. 피펫으로 10mL 샘플셀에 샘플 10mL을 담는다. (the prepared sample).



4. 두번째 샘플셀에 증류수를 10mL 담는다. (the blank)

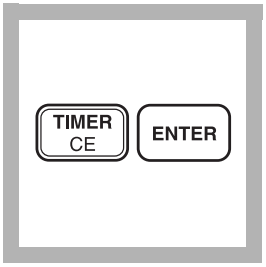
Note: *The sample and blank should be at the same temperature (±1 °C). Temperature adjustments may be made before or after reagent addition.*



5. 피펫으로 2.00 mL의 SPADNS Reagent를 각 샘플셀에 넣고 섞는다.

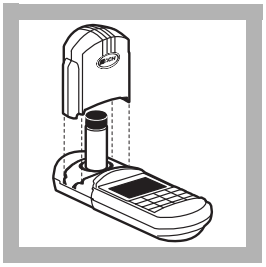
Note: *SPADNS Reagent is toxic and corrosive; use care while measuring. Use a pipet filler.*

Note: *The SPADNS Reagent must be measured accurately.*

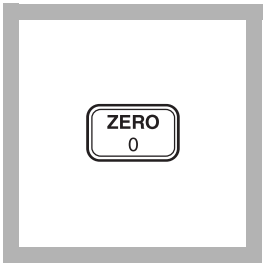


6. TIMER ENTER 입력.

1분간 반응 시간이 시작된다.



7. 타이머가 울리면 blank를 셀 홀더에 넣고 기기 덮개를 덮는다.



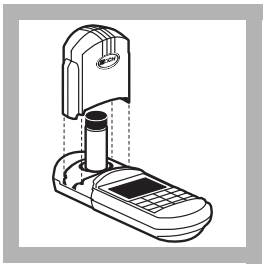
8. ZERO키를 누른다.

화면에 다음과 같이 나타난다:

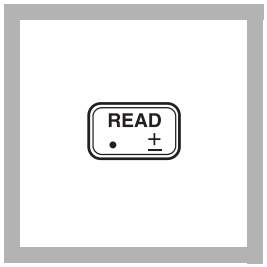
0.00 mg/L F

---

* Adapted from *Standard Methods for the Examination of Water and Wastewater. The procedure for this instrument uses an alternate wavelength outside the accepted 550-580 nm range. The reagents used are the same as those in the USEPA accepted method.*



9. 측정할 샘플을 셀 홀더에 넣고 기기 덮개를 덮는다.

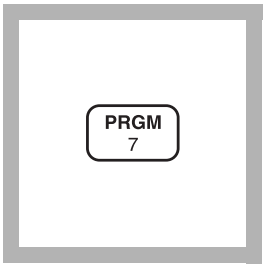


10. READ키를 누른다.

화면에 결과치가 mg/L fluoride로 나타난다.

Note: *Use of the Standard Adjust feature with each new lot of reagent is highly recommended. See Accuracy Check following these steps.*

Using AccuVac Ampuls

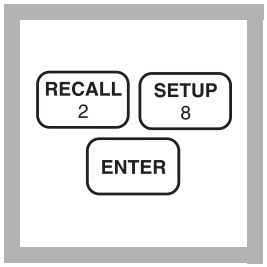


1. Fluoride(F-)의 AccuVac Ampuls 방식 측정을 위해 번호를 선택한다.

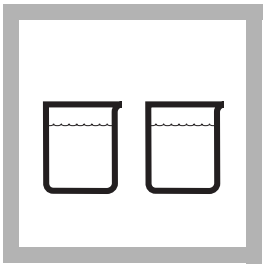
Press: **PRGM**

The display will show:

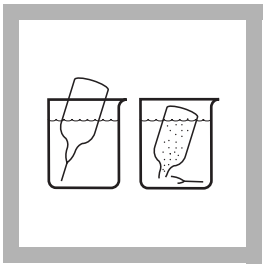
PRGM ?



2. 28번을 선택하고 **ENTER**입력. 화면에 **mg/L, F** 와 **ZERO** 아이콘이 표시.

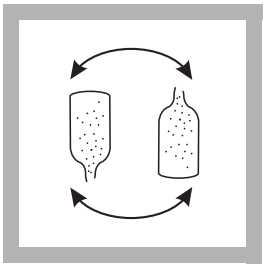


3. 최소 40mL 이상의 샘플을 비커에 채운다. 두번째 비커에 40 mL 이상의 증류수를 채운다.



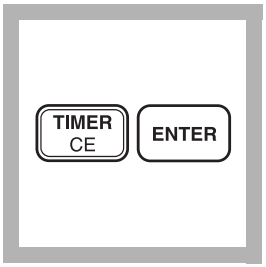
4. SPADNS Fluoride Reagent AccuVac Ampul에 각각 샘플과 증류수를 채운다.

Note: *Keep the tip immersed while the ampule fills completely.*



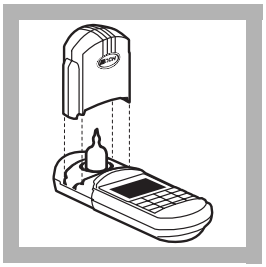
5. Ampule들을 빠르게 수차례 뒤집어 섞어준다. 표면을 깨끗이 닦아준다.

Note: *Do not place finger over the broken tip- the liquid will remain in the ampul.*

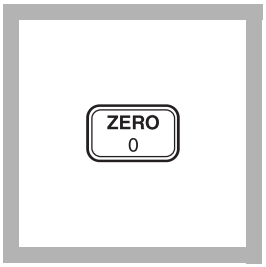


6. TIMER ENTER 입력.

1분간 반응시간이 시작된다.



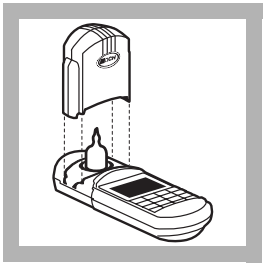
7. 타이머가 울린 후 blank를 셀 홀더에 넣고 기기 덮개를 덮는다.



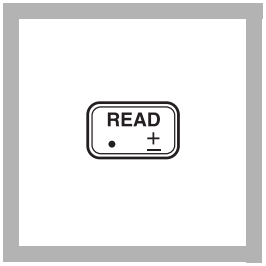
8. ZERO키를 누른다.

화면에 다음과 같이 나타난다:

0.0 mg/L F



9. 샘플이 담긴 AccuVac Ampul을 셀 홀더에 넣고 기기 덮개를 덮는다.



10. READ키를 누른다.

화면에 결과치가 mg/L fluoride로 표시된다.

Note: *Use of the Standard Adjust feature with each new lot of reagent is highly recommended. See Accuracy Check following these steps.*

REQUIRED REAGENTS (Using Solution)

Description	Quantity Required Per Test	Unit	Cat. No.
SPADNS Reagent for Fluoride	4 mL	500 mL	444-49
Water, deionized	10 mL	4 L	272-56

REQUIRED APPARATUS (Using Solution)

Pipet Filler safety bulb	1	each	14651-00
Pipet, volumetric, Class A, 10.00 mL	1	each	14515-38
Pipet, volumetric, Class A, 2.00 mL	1	each	14515-36
Sample Cell, 10-20-25 mL w/ cap	2	6/pkg	24019-06
Thermometer, –20 to 110°C, non-mercury	1	each	26357-02

REQUIRED REAGENTS (Using AccuVac Ampuls)

SPADNS Fluoride Reagent AccuVac Ampuls	2 ampuls	25/pkg	25060-25
Water, deionized	varies	4 L	272-56

REQUIRED APPARATUS (Using AccuVac Ampuls)

Beaker, 50 mL	2	each	500-41H

OPTIONAL REAGENTS

Drinking Water Inorganics Standard for F^-, NO_3^-, PO_4^{3-}, and SO_4^{2-}	500 mL	28330-49
Fluoride Standard Solution, 0.2 mg/L F^-	500 mL	405-02
Fluoride Standard Solution, 0.5 mg/L F^-	500 mL	405-05
Fluoride Standard Solution, 0.8 mg/L F^-	500 mL	405-08
Fluoride Standard Solution, 1.0 mg/L F^-	1000 mL	291-53
Fluoride Standard Solution, 1.0 mg/L F^-	500 mL	291-49
Fluoride Standard Solution, 1.2 mg/L F^-	500 mL	405-12
Fluoride Standard Solution, 1.5 mg/L F^-	500 mL	405-15
Fluoride Standard Solution, 2.0 mg/L F^-	500 mL	405-20
Silver Sulfate, ACS	113 g	334-14
Sodium Arsenite Solution	100 mL MDB	1047-32
StillVer Distillation Solution	500 mL	446-49

OPTIONAL APPARATUS

AccuVac Snapper Kit	each	24052-00
Cylinder, graduated, 100 mL	each	508-42
Cylinder, graduated, 250 mL	each	508-46
Distillation Heater and Support Apparatus Set, 115 V, 50/60 Hz	each	22744-00
Distillation Heater and Support Apparatus Set, 230 V, 50/60 Hz	each	22744-02
Distillation Apparatus General Purpose Accessories	each	22653-00
pH Meter, *sension*™*1,* portable, with electrode	each	51700-10
Pipet, TenSette, 1.0 to 10.0 mL	each	19700-10
Pipet Tips, for 19700-10 TenSette Pipet	50/pkg	21997-96
Stopper	6/pkg	1731-06

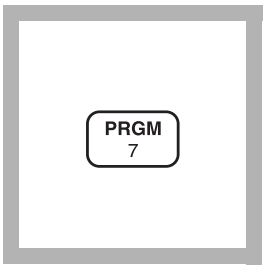
For Technical Assistance, Price and Ordering

In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

HARDNESS (0 to 4.00 mg/L Ca and Mg as $CaCO_3$) For water, wastewater, seawater

Calcium and Magnesium; Calmagite Colorimetric Method



1. magnesium hardness (as CaCO3)를 측정하기 위해 프로그램 번호를 선택한다.

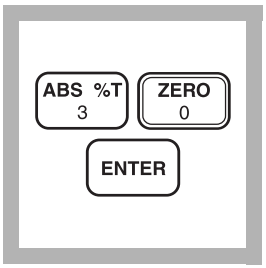
Press: **PRGM**

The display will show:

PRGM ?

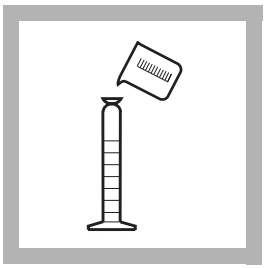
Note: *Adjust the pH of stored samples before analysis.*

Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*



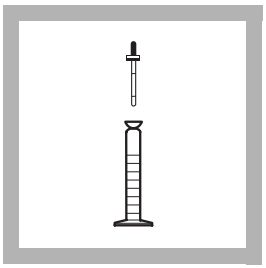
2. 30번을 선택하고 **ENTER**입력. 화면에 **mg/L, CaCO3** 와 **ZERO** 아이콘이 표시**.**

Note: *For alternate forms (Mg, $MgCO_3$), press the* **CONC** *key.*

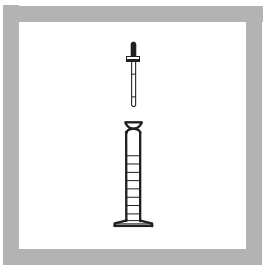


3. 100mL의 샘플을 눈금 실린더에 붓는다.

Note: *The sample temperature should be 21-29 °C (70-84 °F).*

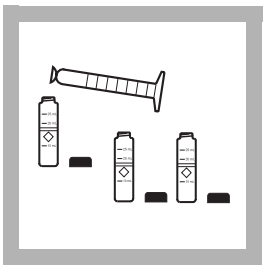


4. 1.0mL의 Calcium and Magnesium Indicator Solution을 첨가하고 마개를 닫은 후 여러번 흔들어서 섞어준다.



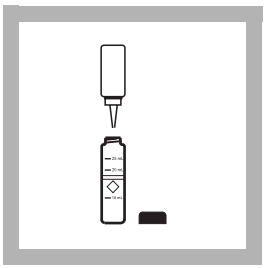
5. 1.0mL의 Alkali Solution for Calcium and Magnesium Test를 첨가하고 마개를 닫은 후 여러번 흔들어 섞어준다.

Note: *If the sample turns read after adding Alkali Solution, dilute sample 1:1 and repeat analysis.*

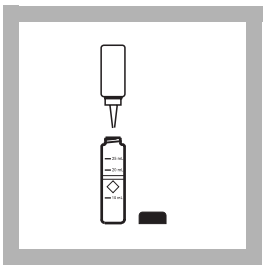


6. 수용액을 10mL씩 3개의 샘플셀에 옮겨 담는다.

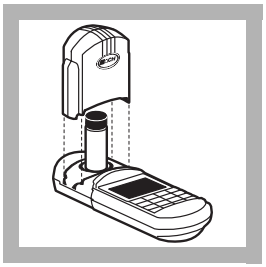
Note: *The test will detect any calcium or magnesium contamination in the mixing cylinder, measuring droppers or sample cells. To test cleanliness, repeat the test multiple times until you obtain consistent results.*



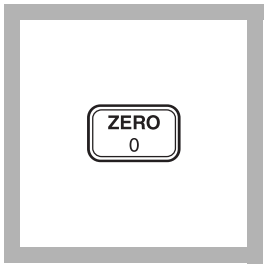
7. 1M EDTA Solution 한 방울을 한개의 셀에 첨가한다 (the blank). 저어서 섞어준다.



8. EGTA Solution 한 방울을 다른 하나의 셀에 첨가한다 (the prepared sample). 저어서 섞어준다.



9. blank를 셀 홀더에 넣고 기기 덮개를 덮어 준다.

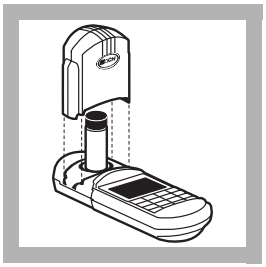


10. ZERO키를 누른다.

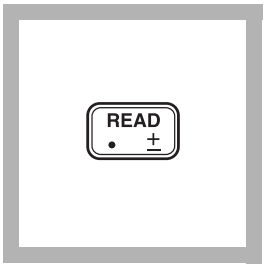
화면에 다음과 같이 나타난다:

0.00 mg/L CaCO3

Note: *If Reagent Blank Correction is on, the display may flash "limit". See Section 1.*

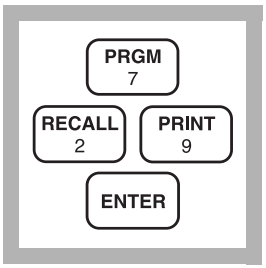


11. 측정할 샘플을 셀 홀더에 넣고 기기 덮개를 덮어준다.



12. READ키를 누른다.

화면에 결과치가 mg/L magnesium hardness (as $CaCO_3$)로 나타난다.



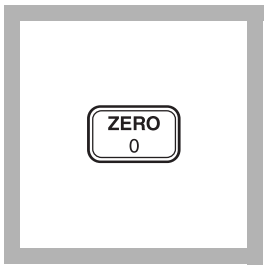
13. 셀을 그대로 두고 다음을 진행한다:

29번 프로그램 선택

The display will show:

PRGM ?

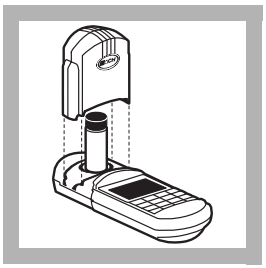
Note: *For alternate forms (Ca) press the* **CONC** *key.*



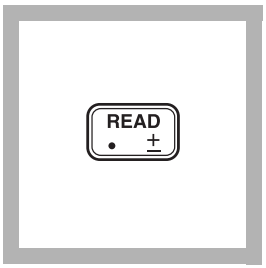
14. ZERO키를 누른다.

화면에 다음과 같이 나타난다:

0.00 mg/L CaCO3



15. 세번째 샘플을 셀 홀더에 넣고 기기 덮개를 덮는다.



16. READ키를 누른다.

화면에 결과치가 mg/L calcium hardness (as $CaCO_3$)로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Section 1).*

Note: *mg/L total hardness = mg/L Ca as $CaCO_3$ + mg/L Mg as $CaCO_3$.*

REQUIRED REAGENTS

	Cat. No.
Hardness Reagent Set (100 Tests)	23199-00
Includes: (1) 22417-32, (1) 22418-32, (1) 22419-26, (1) 22297-26	

Description	Quantity Required Per Test	Unit	Cat. No.
Alkali Solution for Calcium and Magnesium Test	1 mL	100 mL MDB	22417-32
Calcium and Magnesium Indicator Solution	1 mL	100 mL MDB	22418-32
EDTA Solution, 1 M	1 drop	50 mL	22419-26
EGTA Solution	1 drop	50 mL	22297-26

REQUIRED APPARATUS

Cylinder, 100-mL mixing	1	each	1896-42
Dropper, measuring, 0.5 and 1.0 mL	2	20/pkg	21247-20
Sample Cell, 10-20-25 mL, w/cap	3	6/pkg	24019-06

OPTIONAL REAGENTS

Calcium Standard Solution, 2.0 mg/L as $CaCO_3$	946 mL	20581-16
Nitric Acid, ACS	500 mL	152-49
Nitric Acid Solution, 1:1	500 mL	2540-49
Sodium Hydroxide Standard Solution 5.0 N	100 mL MDB	2450-32

OPTIONAL APPARATUS

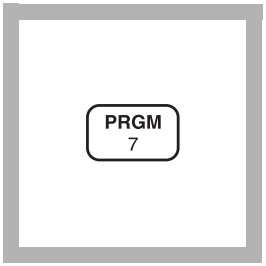
pH Meter, *sension*™*1*, portable, with electrode	each	51700-10
Thermometer, –20 to 110 °C	each	26357-02

HYDRAZINE (0 to 500 µg/L)

For boiler water/feedwater, water and seawater

p-Dimethylaminobenzaldehyde Method*

Using Reagent Solution



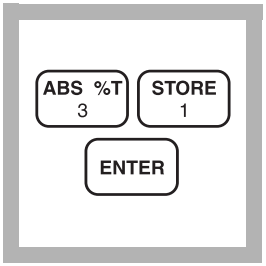
1. Hydrazine (N2H4) 측정을 위해 프로그램 번호를 선택한다.

Press: **PRGM**

The display will show:

PRGM ?

Note: *Samples must be analyzed immediately and cannot be preserved for later analysis.*

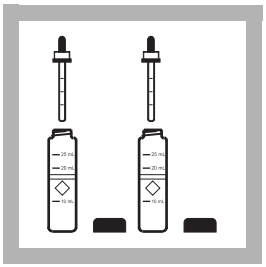


2. 31번을 선택하고 **ENTER**입력. 화면에 **µg/L, N2H4** 와 **ZERO** 아이콘이 표시.

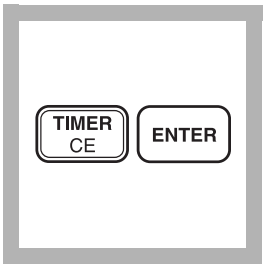
3. 10.0mL의 증류수를 샘플셀에 담는다. (the blank)

4. 10.0mL의 샘플을 두번째 샘플셀에 담는다. (the sample)

Note: *The sample temperature should be 21 ± 4 °C (70 ± 7 °F).*



5. 0.5mL의 HydraVer 2 Hydrazine Reagent를 각 샘플셀에 넣고 마개를 닫고 뒤집어 섞는다.

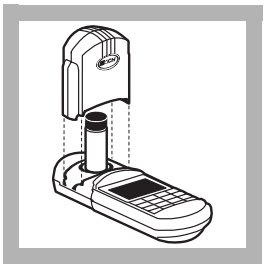


6. TIMER ENTER 입력.

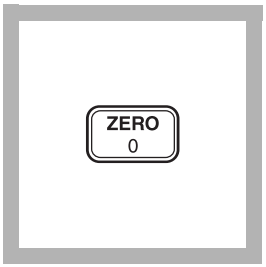
12분간의 반응시간이 시작된다.

Note: *Complete Steps 7-9 within 3 minutes.*

Note: *A yellow color will form if hydrazine is present. The blank will be a faint yellow color due to the HydraVer 2 reagent.*



7. 타이머가 울린 후 즉시 blank를 셀 홀더에 넣고 기기 덮개를 덮어준다.



8. ZERO키를 누른다.

화면에 다음과 같이 나타난다:

0 µg/L N2H4

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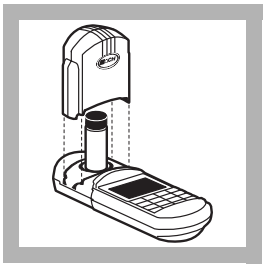
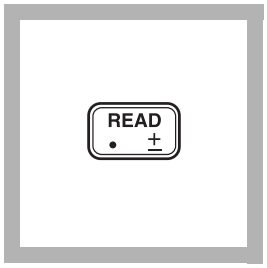
* Adapted from ASTM Manual of Industrial Water, D1385-78, 376 (1979)



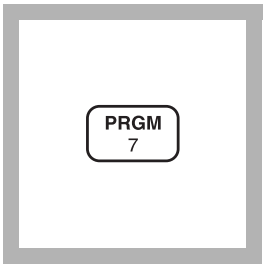
9. 측정할 샘플을 셀 홀더에 넣고 기기 덮개를 덮어준다.



10. **READ**키를 누른다.

화면에 결과치가 µg/L hydrazine로 나타난다.

Using AccuVac Ampuls



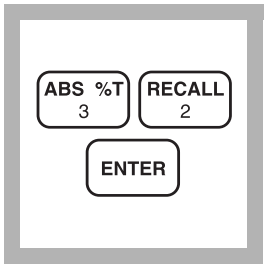
1. Hydrazine (N2H4)의 AccuVac Ampuls방식 측정을 위해 프로그램 번호를 선택한다.

Press: **PRGM**

The display will show:

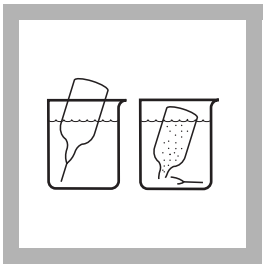
PRGM ?

Note: *Samples must be analyzed immediately and cannot be preserved for later analysis.*



2. **32**번을 선택하고 **ENTER** 입력. 화면에 **µg/L, N2H4** 와 **ZERO** 아이콘이 표시.

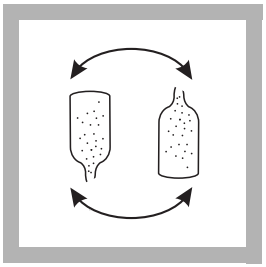
3. 비커에 샘플을 최소 40mL 이상 채운다. 두번째 비커에 증류수를 40mL 이상 채운다.



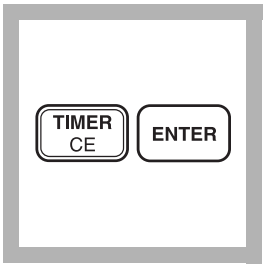
4. Hydrazine AccuVac Ampul 두개에 각각 샘플과 증류수를 채운다.

Note: *Keep the tip immersed while the ampul fills completely.*

Note: *The sample temperature should be 21 ± 4 °C (70 ± 7 °F).*



5. Ampul들을 빠르게 수차례 뒤집어 섞어 준다. 표면을 깨끗이 닦아준다.

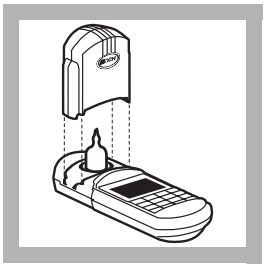


6. TIMER ENTER 입력.

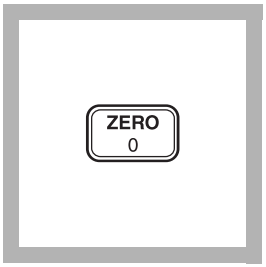
12분간 반응시간이 시작된다.

Note: *Complete Steps 7-9 during this period.*

Note: *A yellow color will develop if hydrazine is present. The blank will be a faint yellow color due to the reagent.*



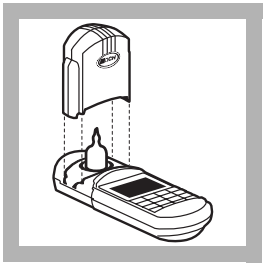
7. blank를 셀 홀더에 넣고 기기 덮개를 덮는다.



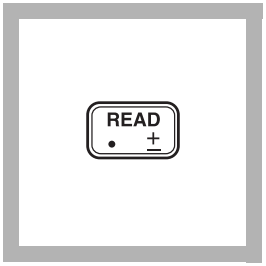
8. ZERO키를 누른다.

화면에 다음과 같이 나타난다:

0 µg/L N2H4



9. 측정할 샘플을 셀 홀더에 넣고 기기 덮개를 덮는다.



10. 타이머가 울린 후 **READ**키를 누른다.

화면에 결과치가 µg/L hydrazine로 나타난다.

REQUIRED REAGENTS (Using Reagent Solution)

Description	Quantity Required Per Test	Unit	Cat. No.
HydraVer 2 Hydrazine Reagent	1 mL	100 mL MDB	1790-32
Water, deionized	10 mL	4 L	272-56

REQUIRED APPARATUS (Using Reagent Solution)

Cylinder, graduated, 25 mL	1	each	508-40
Sample Cells, 10-, 20- and 25 mL, w/ caps	2	6/pkg	24019-06

REQUIRED REAGENTS (Using AccuVac Ampuls)

Hydrazine Reagent AccuVac Ampul	2	25/pkg	25240-25
Water, deionized	10 mL	4 L	272-56

REQUIRED APPARATUS (Using AccuVac Ampuls)

Beaker, 50 mL	2	each	500-41H

OPTIONAL REAGENTS

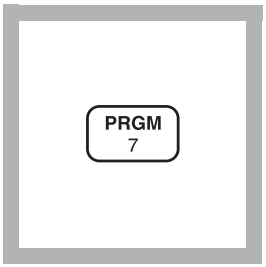
Hydrazine Sulfate, ACS		100 g	742-26

OPTIONAL APPARATUS

AccuVac Snapper Kit		each	24052-00
Balance, Analytical, 115 V, 0.1 mg		each	28014-01
Balance, Analytical, 220 V, 0.1 mg		each	28014-02
Cylinder, graduated, mixing, 25 mL		each	1896-40
Flask, volumetric, 100 mL, Class A		each	14574-42
Flask, volumetric, 1000 mL, Class A		each	14574-53
Pipet, serological, 1 mL		each	9190-02
Pipet, TenSette, 0.1 to 1.0 mL		each	19700-01
Pipet Tips, for 19700-01 TenSette Pipet		50/pkg	21856-96
Pipet, volumetric, Class A, 1.00 mL		each	14515-35
Pipet, volumetric, Class A, 4.00 mL		each	14515-04
Pipet Filler, safety bulb		each	14651-00
Thermometer, –20 to 110 °C, non-mercury		each	26357-02
Weighing Boat, 67/46 mm, 8.9 cm sq.		500/pkg	21790-00

1,10 Phenanthroline Method* (Powder Pillows or AccuVac Ampuls)

Using Powder Pillows



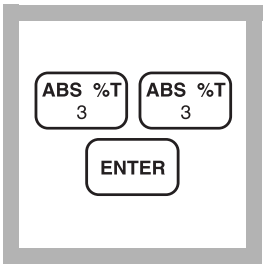
1. stored program에서 powder pillows 방식의 Ferrous iron (Fe^{2+})-측정을 위해 번호선택.

Press: **PRGM**

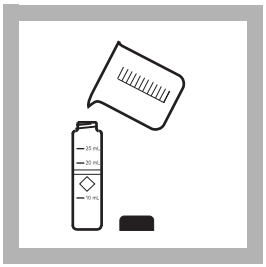
The display will show:

PRGM ?

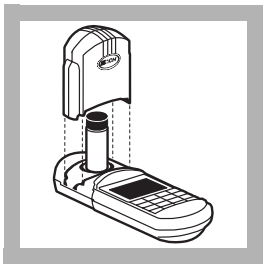
Note: *Analyze samples as soon as possible to prevent oxidation of ferrous iron to ferric iron, which is not determined.*



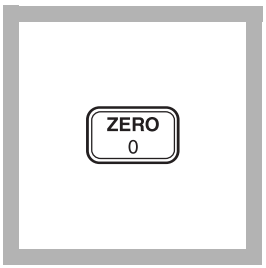
2. 33번을 선택하고 **ENTER**입력. 화면에 **mg/L, Fe** 와 **ZERO**이 표시.



3. 샘플셀에 샘플을 25mL 채운다. (the blank).



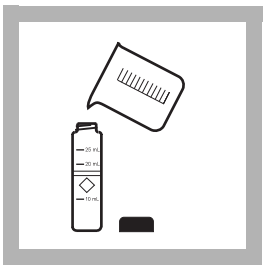
4. blank를 셀 홀더에 넣고 기기 덮개를 덮는다.



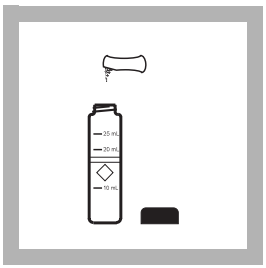
5. ZERO키를 누른다.

화면에 다음과 같이 나타난다:

0.00 mg/L Fe

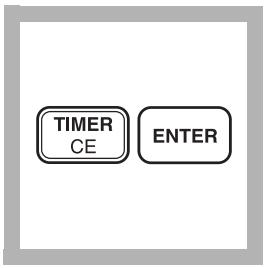


6. 다른 샘플셀에 샘플을 25mL 채운다.



7. Ferrous Iron Reagent Powder Pillow를 하나 샘플셀에 첨가한다. (The prepared sample). 마개를 닫고 뒤집어서 섞어준다.

Note: *Undissolved powder does not affect accuracy.*



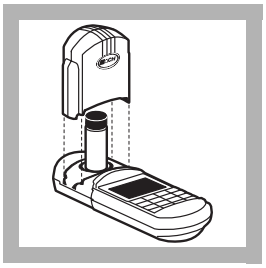
8. TIMER ENTER 입력

3분간 반응 시간이 표시된다.

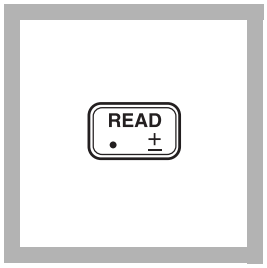
Note: *An orange color will form if ferrous iron is present.*

---

* Adapted from *Standard Methods for the Examination of Water and Wastewater.*



9. 측정할 샘플을 셀 홀더에 넣고 기기 덮개를 덮는다.

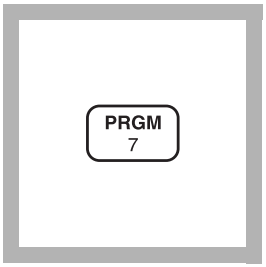


10. **READ**키를 누른다.

화면에 결과치가 mg/L ferrous iron으로 표시된다.

Note: *Standard Adjust may be performed using a prepared standard (see Section 1).*

Using AccuVac Ampuls



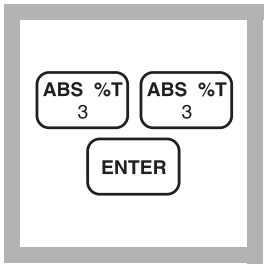
1. stored program에서 AccuVac ampuls 방식의 ferrous iron (Fe^{2+}) 측정 번호를 선택한다.

Press: **PRGM**

The display will show:

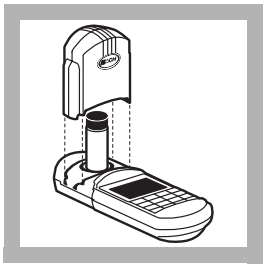
PRGM ?

Note: *Analyze samples as soon as possible to prevent air oxidation of ferrous iron to ferric, which is not determined.*

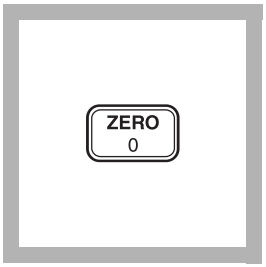


2. **33**번을 선택하고 **ENTER.** 화면에 **mg/L, Fe** 와 **ZERO** 아이콘 표시.

3. 샘플셀에 샘플을 10mL이상 채운다. (the blank). 40mL 이상의 샘플을 비커에 채운다.



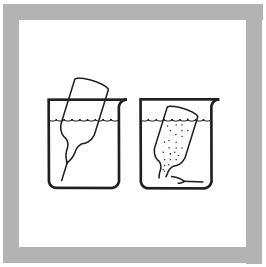
4. blank를 셀홀더에 끼우고 기기 덮개를 덮는다.



5. ZERO 키를 누른다.

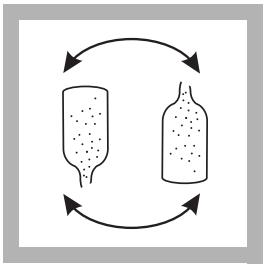
화면에 다음같이 표시:

0.00 mg/L Fe



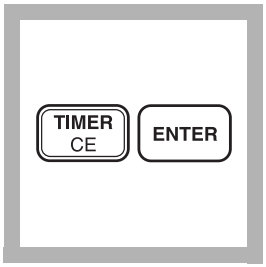
6. Ferrous Iron AccuVac Ampul에 샘플을 채운다.

Note: *Keep the tip immersed while the ampul fills completely.*



7. 빠르게 엠퓰을 수차례 뒤집어서 섞어준다. 앰퓰의 표면을 깨끗이 닦는다.

Note: *Undissolved powder does not affect accuracy.*

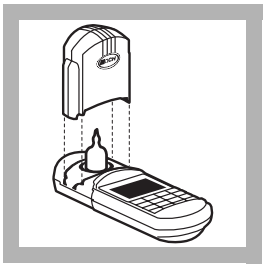


8. 다음 버튼을 누른다:

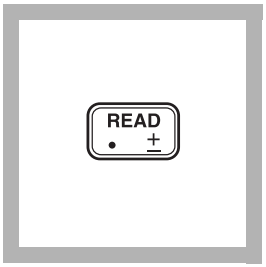
TIMER ENTER

3분간의 반응시간이 표시된다.

Note: *An orange color will form if ferrous iron is present.*



9. 앰퓰을 셀 홀더에 넣고 기기 덮개를 덮는다.



10. READ키를 누른다.

화면에에 결과치가 mg/L ferrous iron으로 표시한다.

Note: *Standard Adjust may be performed using a prepared standard (see Standard Adjust in Section 1).*

REQUIRED REAGENTS & APPARATUS (USING POWDER PILLOWS)

Description	Quantity Required Per Test	Units	Cat. No.
Ferrous Iron Reagent Powder Pillows	1 pillow	100/pkg	1037-69
Sample Cell, 10-20-25 mL, w/ cap	2	6/pkg	24019-06

REQUIRED REAGENTS & APPARATUS (USING ACCUVAC AMPULS)

Ferrous Iron Reagent AccuVac Ampuls	1 ampul	25/pkg	25140-25
Beaker, 50 mL	1	each	500-41H

OPTIONAL REAGENTS

Ferrous Ammonium Sulfate, hexahydrate, ACS		113 g	11256-14
Water, deionized		4 L	272-56

OPTIONAL APPARATUS

AccuVac Snapper Kit		each	24052-00
Balance, analytical, 115 V, 0.1 mg		each	28014-01
Balance, analytical, 230 V, 0.1 mg		each	28014-02
Clippers, for opening powder pillows		each	968-00
Flask, volumetric, 100 mL, Class A		each	14574-42
Flask, volumetric, 1000 mL, Class A		each	14574-53
Pipet, volumetric, Class A, 1.00 mL		each	14515-35
Pipet Filler, safety bulb		each	14651-00
Weighing Boat, 67/46 mm, 8.9 cm square		500/pkg	21790-00

For Technical Assistance, Price and Ordering

In the U.S.A.—Call 800-227-4224

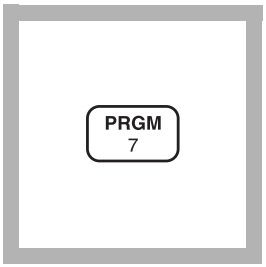
Outside the U.S.A.—Contact the Hach office or distributor serving you.

IRON, TOTAL (0 to 3.00 mg/L)

For water, wastewater, and seawater

FerroVer Method (Powder Pillows or AccuVac Ampuls)

USEPA approved for reporting wastewater analysis (digestion is required; see Section 2*)



1. iron (Fe)의 powder pillows 방식 측정을 위해 번호를 선택한다.

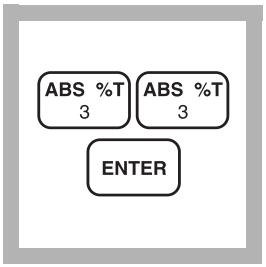
Press: **PRGM**

The display will show:

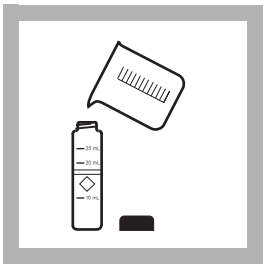
PRGM ?

Note: *Determination of total iron requires a digestion prior to analysis (see Section 2).*

Note: *Adjust pH of stored samples before analysis.*

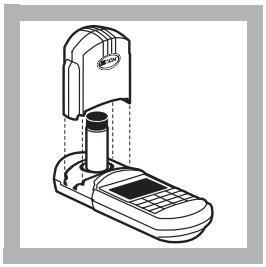


2. 33번을 선택하고 **ENTER.** 화면에 **mg/L, Fe** 와 **ZERO**이 표시된다.

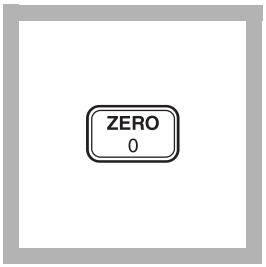


3. 샘플셀에 샘플을 10mL 채운다. (the blank).

Note: *For turbid samples, treat the blank with one 0.1-gram scoop of RoVer Rust Remover. Swirl to mix.*



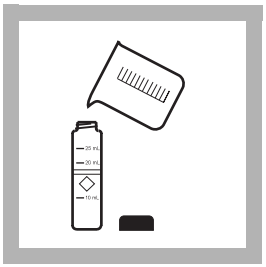
4. blank를 셀 홀더에 넣고 기기 덮개를 덮는다.



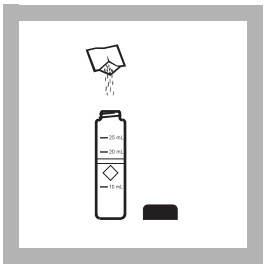
5. ZERO키를 누른다.

화면에 다음같이 표시:

0.00 mg/L Fe

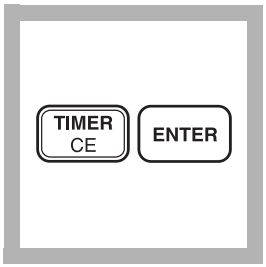


6. 샘플셀에 샘플을 10mL 채운다.



7. FerroVer Iron Reagent Powder Pillow 를 하나 첨가한다. (the prepared sample). 뚜껑을 닫고 흔들어서 파우더를 용해시킨다 .

Note: *Accuracy is not affected by undissolved powder.*



8. 다음 버튼을 누른다:

TIMER ENTER

3분간의 반응시간이 표시된다.

Note: *An orange color will form if iron is present.*

Note: *Samples containing visible rust should be allowed to react at least five minutes.*

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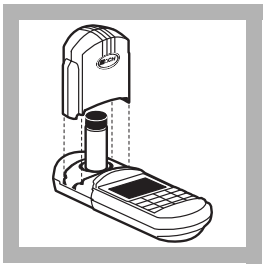
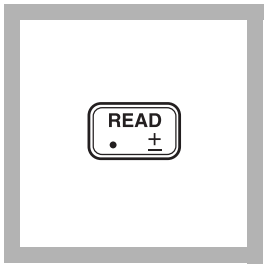
* *Federal Register*, 45 (126) 43459 (June 27, 1980). See also 40 CFR, part 136.3, Table IB.



9. 반응이 끝나면 샘플 셀을 셀 홀더에 넣고 기기 덮개를 덮는다.

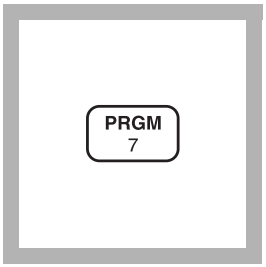


10. **READ**키를 누른다.

결과치가 화면에 mg/L iron (Fe)로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Section 1).*

Using AccuVac Ampuls



1. iron (Fe)의 AccuVac ampuls 방식 측정 번호를 선택한다.

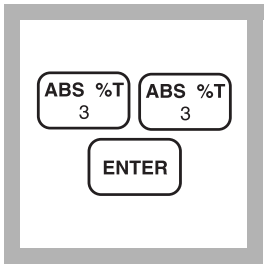
Press: **PRGM**

The display will show:

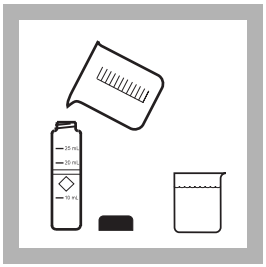
PRGM ?

Note: *Adjust pH of stored samples before analysis.*

Note: *Determination of total iron requires a digestion prior to analysis (see Section 2).*

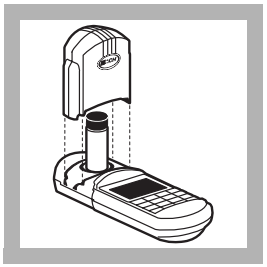


2. **33**번을 선택하고 **ENTER**. 화면에 **mg/L, Fe**와 **ZERO** 아이콘이 표시.

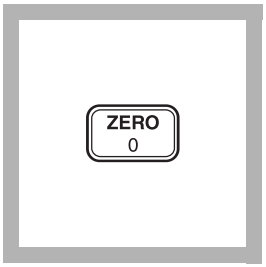


3. 샘플셀에 샘플을 10mL 이상 채운다. (the blank). 비커에 샘플을 40mL 이상 채운다.

Note: *For turbid samples, treat the blank with one 0.1 g scoop of RoVer Rust Remover. Swirl to mix.*



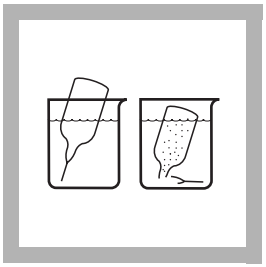
4. blank를 셀 홀더에 끼우고 기기 덮개를 덮는다.



5. ZERO키를 누른다.

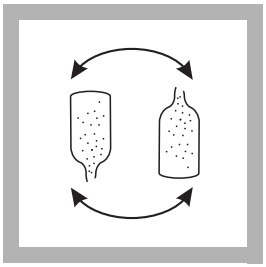
화면에 다음과 같이 나타난다:

0.00 mg/L Fe



6. FerroVer AccuVac Ampul에 샘플을 채운다.

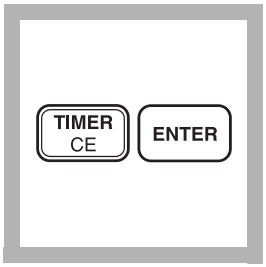
Note: *Keep the tip immersed while the ampul fills completely.*



7. 앰퓰을 빠르게 여러번 뒤집어서 섞어준다. 표면을 깨끗이 닦는다.

Note: *An orange color will form if iron is present.*

Note: *Accuracy is not affected by undissolved powder.*

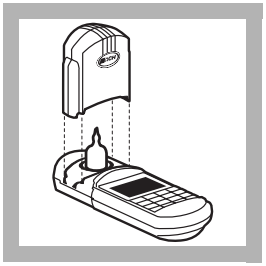


8. 다음 버튼을 누른다:

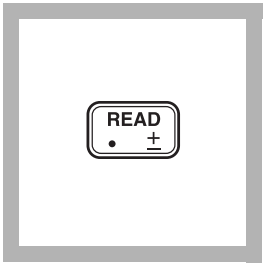
TIMER ENTER

3분간의 반응시간이 표시된다.

Note: *Samples containing visible rust should be allowed to react at least five minutes.*



9. AccuVac ampul을 셀 홀더에 넣고 기기 덮개를 덮는다.



10. READ키를 누른다.

화면에 결과치가 mg/L iron (Fe)으로 표시된다.

Note: *Standard Adjust may be performed using a prepared standard (see Section 1).*

REQUIRED REAGENTS & APPARATUS (Using Powder Pillows)

Description	Quantity Required Per Test	Unit	Cat No.
FerroVer Iron Reagent Powder Pillows	1 pillow	100/pkg	21057-69
Sample cell, 10-20-25 mL, with screw cap	1	6/pkg	24019-06

REQUIRED REAGENTS & APPARATUS (Using AccuVac Ampuls)

FerroVer Iron Reagent AccuVac Ampuls	1 ampul	25/pkg	25070-25
Beaker, 50 mL	1	each	500-41H

OPTIONAL REAGENTS

Description	Unit	Cat. No.
Ammonium Hydroxide, ACS	500 mL	106-49
Drinking Water Standard, Metals, LR (Cu, Fe, Mn)	500 mL	28337-49
Drinking Water Standard, Metals, HR (Cu, Fe, Mn)	500 mL	28336-49
Hydrochloric Acid Standard Solution, 6 N	500 mL	884-49
Hydrochloric Acid, ACS	500 mL	134-49
Iron Standard Solution, 100 mg/L	100 mL	14175-42
Iron Ampule Standard, 50 mg/L	20/pkg	14254-20
Nitric Acid, ACS	500 mL	152-49
Nitric Acid Solution, 1:1	500 mL	2540-49
RoVer Rust Remover	454 g	300-01
Sodium Hydroxide Standard Solution, 5.0 N	100 mL MDB	2450-32
Water, deionized	4 L	272-56

OPTIONAL APPARATUS

AccuVac Snapper Kit	each	24052-00
Ampule Breaker, PourRite Ampules	each	24846-00
Clippers, Shears $7^1/_4$ "	each	23694-00
Cylinder, graduated, poly, 25 mL	each	1081-40
Cylinder, graduated, poly, 100 mL	each	1081-42
Digesdahl Digestion Apparatus, 115 V	each	23130-20
Digesdahl Digestion Apparatus, 230 V	each	23130-21
Filter Discs, glass, 47 mm	100/pkg	2530-00
Filter Holder, membrane	each	2340-00
Filter Pump	each	2131-00
Flask, Erlenmeyer, 250 mL	each	505-46
Flask, filtering, 500 mL	each	546-49
Flask, volumetric, Class A, 50 mL	each	14574-41
Flask, volumetric, Class A, 100 mL	each	14574-42
Hot Plate, 4" diameter, 120 VAC	each	12067-01
Hot Plate, 4" diameter, 240 VAC	each	12067-02
pH Meter, *sension*™*1*, portable, with electrode	each	51700-10
pH Indicator Paper, 1 to 11 pH	each	391-33

OPTIONAL APPARATUS

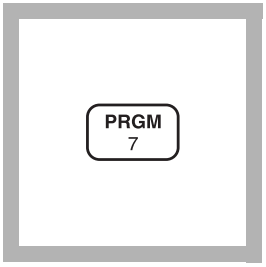
Pipet Filler, safety bulb	each	14651-00
Pipet, serological, 2 mL	each	532-36
Pipet, serological, 5 mL	each	532-37
Pipet, TenSette, 0.1 to 1.0 mL	each	19700-01
Pipet Tips, for 19700-01 TenSette Pipet	50/pkg	21856-96
Pipet Tips, for 19700-01 TenSette Pipet	1000/pkg	21856-28
Pipet, volumetric, Class A, 1.00 mL	each	14515-35
Spoon, measuring, 0.1 g	each	511-00

For Technical Assistance, Price and Ordering

In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

FerroZine Method*



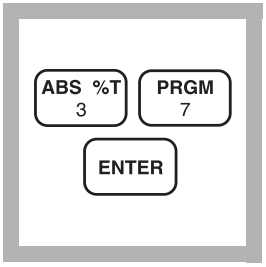
1. stored program에서 iron (Fe) 측정항목 번호를 선택한다.

Press: **PRGM**

The display will show:

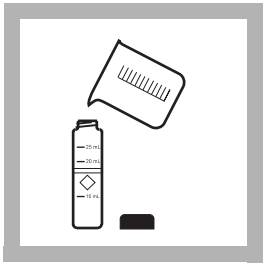
PRGM ?

Note: *Adjust the pH of stored samples before analysis.*



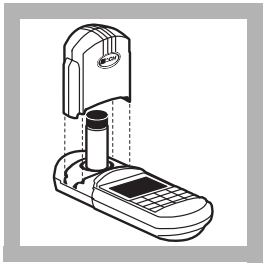
2. 37번을 선택하고 **ENTER.** 화면에 **mg/L, Fe** 와 **ZERO** 아이콘이 표시.

Note: *Total iron determinations need a prior digestion; use any of the three procedures given in Digestion (Section 2).*

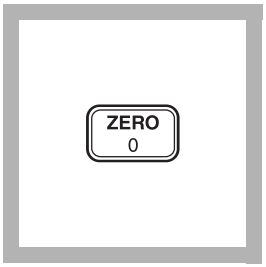


3. 샘플셀에 샘플을 25mL 채운다. (the blank)

Note: *Rinse glassware with a 1:1 Hydrochloric Acid Solution and deionized water before use to avoid errors due to iron deposits on the glass.*



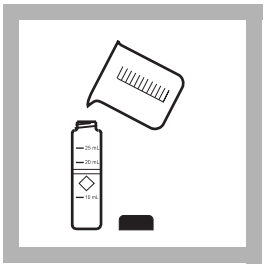
4. blank를 셀 홀더에 넣고 기기 덮개를 덮는다.



5. ZERO키를 누른다.

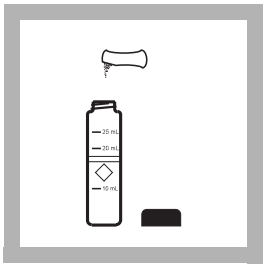
화면에 다음같이 표시된다:

0.000 mg/L Fe



6. 다른 샘플셀에 샘플을 25mL 채운다.

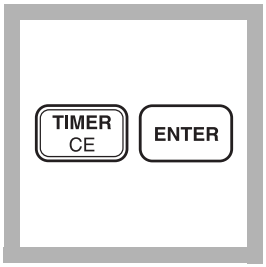
Note: *If the sample contains rust, see Interferences below.*



7. FerroZine Iron Reagent Solution Pillow 를 하나 첨가하고 흔들어서 섞어준다. (the prepared sample)

Note: *Do not allow the clippers to come into contact with the contents of the pillow.*

Note: *If preferred , use 0.5 mL of FerroZine Iron Reagent Solution in place of the solution pillow.*



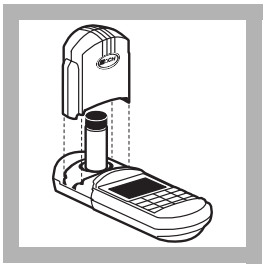
8. 다음 버튼을 누른다:

TIMER ENTER

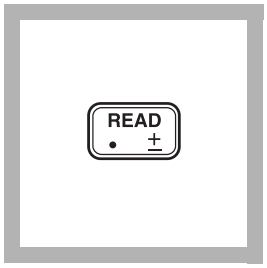
5분간의 반응시간이 표시된다.

Note: *A violet color will develop if iron is present.*

* Adapted from Stookey, L.L., Anal. Chem., 42 (7) 779 (1970)



9. 반응이 끝난 샘플셀을 셀 홀더에 넣고 기기 덮개를 덮는다.



10. **READ**키를 누른다.

결과치가 화면에 mg/L iron으로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Section 1).*

REQUIRED REAGENTS AND APPARATUS

Description	Quantity Required Per Test	Unit	Cat. No.
FerroZine Iron Reagent Solution Pillows	1 pillow	50/pkg	2301-66
Clippers, for opening pillows	1	each	968-00
Sample Cell, 10-20-25, w/cap	2	6/pkg	24019-06

OPTIONAL REAGENTS

Ammonium Hydroxide, ACS	500 mL	106-49	Drinking
Water Standard, Metals, LR (Cu, Fe, Mn)	500 mL	28337-49	
Hydrochloric Acid Solution, 1:1 (6N)	500 mL	884-49	
FerroZine Iron Reagent Solution	500 mL	2301-49	
Iron Standard Solution, 100 mg/L Fe	100 mL	14175-42	
Iron Standard Solution, Voluette Ampule, 25 mg/L Fe, 10 mL	16/pkg	14253-10	
Nitric Acid, ACS	500 mL	152-49	
Nitric Acid Solution, 1:1	500 mL	2540-49	
Water, deionized	4 L	272-56	

OPTIONAL APPARATUS

Ampule Breaker Kit	each	21968-00
Clippers, shears, 7¼-inch	each	20658-00
Cylinder, graduated, 25 mL	each	508-40
Dropper, calibrated, 0.5-mL & 1.0-mL mark	6/pkg	23185-06
Flask, erlenmeyer, 125 mL	each	505-43
Flask, volumetric, 250 mL, Class A	each	14574-46
Hot plate, 3 ½" diameter, 120 V	each	12067-01
Hot plate, 3 ½" diameter, 240 V	each	12067-02
pH Indicator Paper, 1 to 11 pH	5 rolls/pkg	391-33
Pipet, serological, 2 mL	each	532-36
pH Meter, *sension*™*1*, portable, with electrode	each	51700-10
Pipet, TenSette, 0.1 to 1.0 mL	each	19700-01
Pipet Tips, for 19700-01 TenSette Pipet	50/pkg	21856-96 Pipet
Tips, for 19700-01 TenSette Pipet	1000/pkg	21856-28
Pipet, volumetric, 1.00 mL, Class A	each	14515-35
Thermometer, –20 to 110 °C, non-mercury	each	26357-02
Water Bath, with sample cell rack	each	1955-55

For Technical Assistance, Price and Ordering

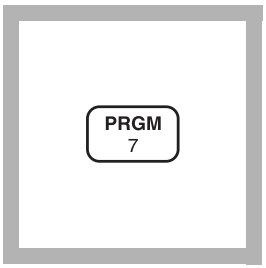
In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

IRON, TOTAL (0 to 1.80 mg/L)

For cooling water with molybdenum-based treatment

FerroMo™ Method*



1. stored program에서 iron (Fe) 측정항목의 번호를 선택한다.

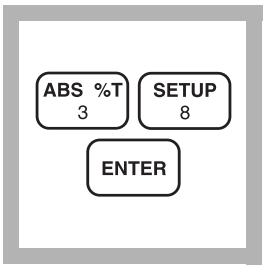
Press: **PRGM**

The display will show:

PRGM ?

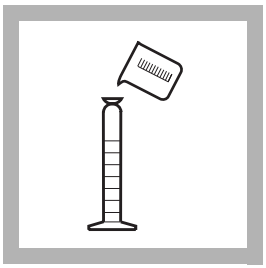
Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*

Note: *Adjust the pH of stored samples before analysis.*



2. **38**번을 선택하고 **ENTER.** 화면에 **mg/L, Fe** 와 **ZERO** 아이콘이 표시.

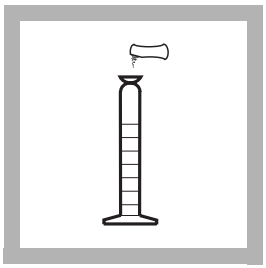
Note: *Determination of total iron requires digestion; see Section 2.*



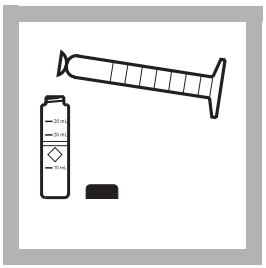
3. 50mL 눈금 실린더에 샘플을 50mL 채운다.

Note: *Sample pH is important in the test; see Interferences.*

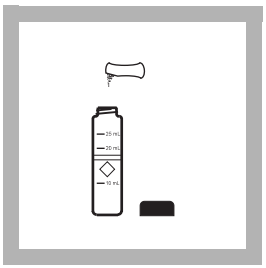
Note: *Rinse glassware with 1:1 Hydrochloric Acid Solution. Rinse again with deionized water. This removes iron deposits which can cause slightly high results.*



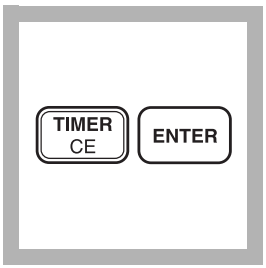
4. FerroMo Iron Reagent 1 Powder Pillow를 하나 실린더에 첨가하고 마게를 닫고 여러번 뒤집어서 섞어준다. 마개를 제거한다.



5. 실린더에서 25mL의 샘플을 샘플셀에 옮겨 담는다.



6. FerroMo Iron Reagent 2 Powder Pillow를 샘플셀에 첨가한다. 마개를 닫고 30초간 흔들어 섞어준다. 이 용액이 측정할 샘플이 된다.

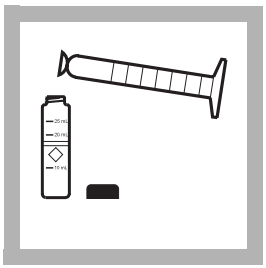


7. 다음 버튼을 누른다:

TIMER ENTER

3분간 반응 시간이 시작된다.

Note: *A blue color will develop if iron is present.*



8. Step 4의 샘플을 샘플셀에 옮겨 담는다. (the blank)

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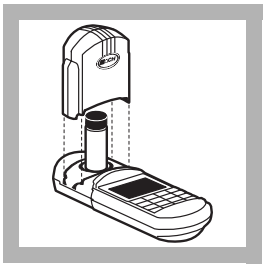
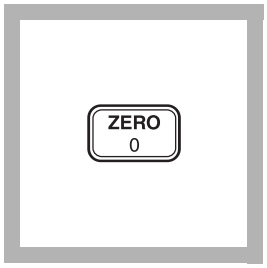
* Adapted from G. Frederic Smith Chemical Company, *The Iron Reagents*, 3rd ed. (1980).



9. blank를 셀 홀더에 넣고 기기 덮개를 덮는다.

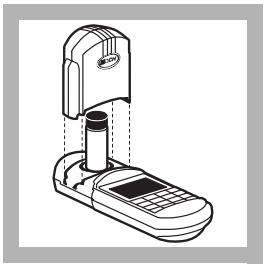


10. ZERO키를 누른다.

화면에 다음과 같이 표시된다:

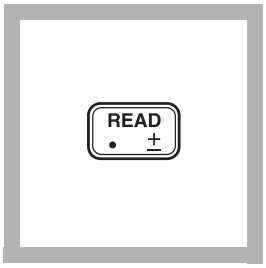
0.00 mg/L Fe

Note: *If Reagent Blank Correction is on, the display may flash "limit". See Section 1.*



11. 타이머가 울린 후 측정할 샘플을 셀 홀더에 넣고 기기 덮개를 덮는다.

Note: *For samples containing high levels of molybdate (≥100 mg/L), read the sample immediately after zeroing the blank.*



12. READ키를 누른다.

화면에 결과치가 mg/L iron으로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Section 1).*

REQUIRED REAGENTS

	Cat. No.
FerroMo Reagent Set (100 tests)	25448-00
Includes: (4) 25437-68, (2) 25438-66	

Description	Quantity Required Per Test	Unit	Cat. No
FerroMo Iron Reagent 1 Powder Pillows	1 pillow	25/pkg	25437-68
FerroMo Iron Reagent 2 Powder Pillows	1 pillow	50/pkg	25438-66

REQUIRED APPARATUS

Clippers, for opening powder pillows	1	each	968-00
Cylinder, graduated, mixing, 50 mL	1	each	1896-41
Sample Cell, 10-20-25 mL, w/cap	2	6/pkg	24019-06

OPTIONAL REAGENTS

Hydrochloric Acid Solution, 6.0 N (1:1)	500 mL	884-49
Hydrochloric Acid, ACS	500 mL	134-49
Iron Standard Solution, 100 mg/L Fe	100 mL	14175-42
Iron Standard Solution, PourRite Ampule, 25 mg/L Fe, 2 mL	20/pkg	24629-20
Sodium Hydroxide Standard Solution, 1.0 N	100 mL MDB	1045-32
Sodium Hydroxide Standard Solution, 5.0 N	100 mL MDB	2450-32
Sulfuric Acid Standard Solution, 1.0 N	100 mL MDB	1270-32
Water, deionized	4 L	272-56

OPTIONAL APPARATUS

Ampule Breaker Kit	each	24846-00
Flask, volumetric, Class A, 250 mL	each	14574-46
pH Indicator Paper, 1 to 11 pH	5 rolls/pkg	391-33
pH Meter, *Sension*™*1*, portable, with electrode	each	51700-10
Pipet Filler, safety bulb	each	14651-00
Pipet, TenSette, 0.1 to 1.0 mL	each	19700-01
Pipet Tips, for 19700-01 Pipet	50/pkg	21856-96
Pipet Tips, for 19700-01 Pipet	1000/pkg	21856-28
Pipet, volumetric, Class A, 1.00 mL	each	14515-35

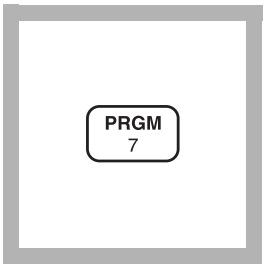
For Technical Assistance, Price and Ordering

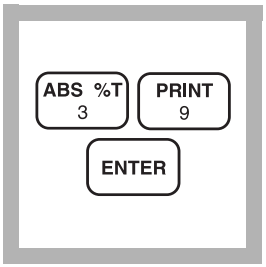
In the U.S.A.—Call 800-227-4224

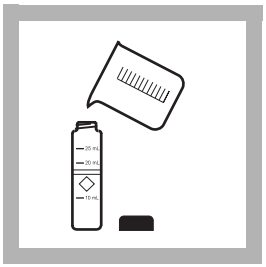
Outside the U.S.A.—Contact the Hach office or distributor serving you.

TPTZ Method* (Powder Pillows or AccuVac Ampuls)

Using Powder Pillows







1. iron (Fe)의 powder pillows 방식 측정번호를 선택한다.

Press: **PRGM**

The display will show:

PRGM ?

Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*

Note: *Adjust the pH of stored samples before analysis.*

2. **39**번을 선택하고 **ENTER.** 화면에 **mg/L, Fe** 와 **ZERO** 아이콘이 표시된다**.**

Note: *Total iron determination needs a prior digestion. Use any of the procedures in Digestion (Section 2).*

3. 샘플셀에 샘플을 10mL 채운다.

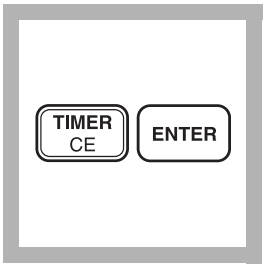
Note: *Sample pH is important in this test; see Interferences.*

Note: *Rinse glassware with a 1:1 hydrochloric acid and deionized water before use to avoid errors due to iron deposits on the glass.*

4. TPTZ Iron Reagent Powder Pillow를 하나 샘플셀에 첨가한다.(the prepared sample). 마게를 닫고 30초간 흔들어 준다.

Note: *A blue color will develop if iron is present.*

* Adapted from G. Frederic Smith Chemical Co., *The Iron Reagents*, 3rd ed. (1980).



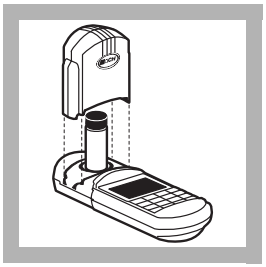
5. 다음 버튼을 누른다:

TIMER ENTER

3분간 반응시간이 표시된다.

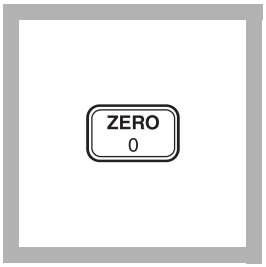
Note: *Continue with Steps 6 to 8 while the timer is running.*

6. 두번째 샘플셀에 샘플을 10mL 채운다. (the blank)



7. blank를 셀 홀더에 넣고 기기 덮개를 덮는다.

Note: *Press* **EXIT** *to zero the instrument while the timer is running.*

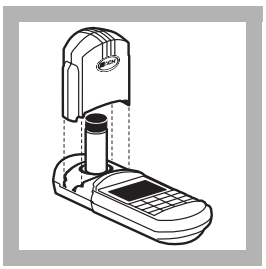


ZERO키를 누른다.

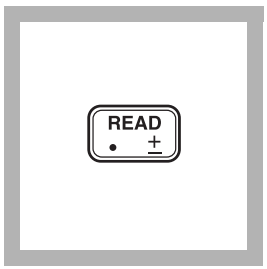
화면에 다음과 같이 나타난다:

0.00 mg/L Fe

만약 Reagent Blank Correction이 켜져 있다면 화면에 "limit"이 깜박일 것이다. Section 1참조.



8. 타이머가 울리면 측정할 샘플셀을 셀 홀더에 넣고 기기 덮개를 덮는다.

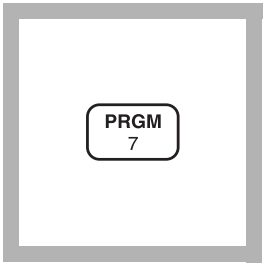


9. **READ**키를 누른다.

결과치가 화면에 mg/L iron으로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Section 1).*

Using AccuVac Ampuls



1. iron (Fe)의 AccuVac Ampuls 방식 측정번호를 선택한다.

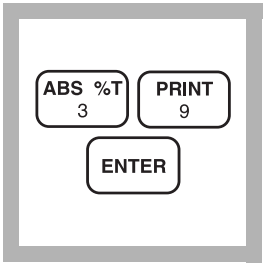
Press: **PRGM**

The display will show:

PRGM ?

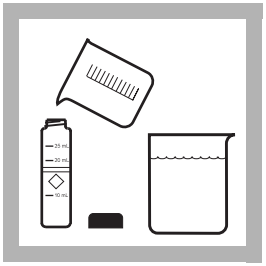
Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*

Note: *Adjust the pH of stored samples before analysis.*



2. 39번을 선택하고 **ENTER.** 화면에 **mg/L, Fe**와 **ZERO** 아이콘이 표시된다.

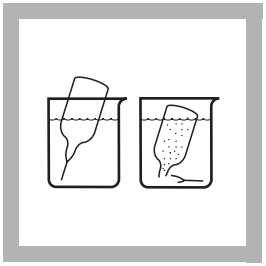
Note: *Total iron determination needs a prior digestion. Use any of the three procedures in Digestion (Section 2).*



3. 샘플셀에 샘플을 10mL 이상 채운다. (the blank) 비커에 40mL이상 샘플을 채워둔다.

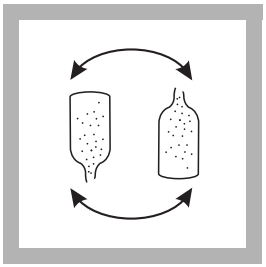
Note: *Sample pH is important in this test; see Interferences.*

Note: *Rinse glassware with a 1:1 hydrochloric acid and deionized water before use to avoid errors due to iron deposits on the glass.*



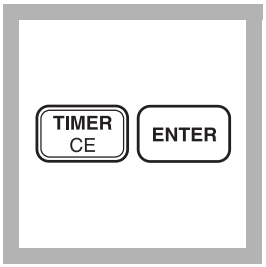
4. TPTZ Iron AccuVac Ampul에 샘플을 채운다.

Note: *Keep the tip immersed while the ampul fills completely.*



5. ampul을 반복해서 뒤집어 섞어준다. (the prepared sample) 앰퓰의 표면을 깨끗이 닦는다.

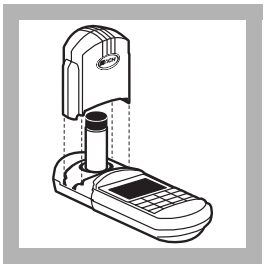
Note: *A blue color will develop if iron is present.*



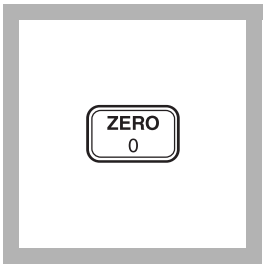
6. 다음 버튼을 누른다:

TIMER ENTER

3분간의 반응시간이 표시된다.



7. blank를 셀 홀더에 넣고 기기 덮개를 덮어준다.



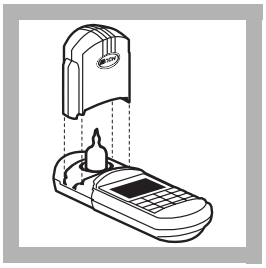
8. ZERO키를 누른다.

화면에 다음과 같이 표시된다:

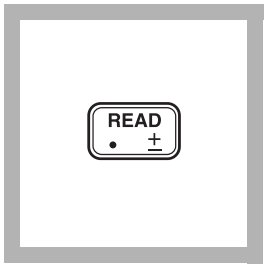
0.00 mg/L Fe

Note: *Press* **EXIT** *to zero the instrument while the timer is running.*

Note: *If Reagent Blank Correction is on, the display may flash "limit". See Section 1.*



9. 타이머가 울리면 엠퓰을 셀 홀더에 넣고 기기 덮개를 덮는다.



10. **READ**버튼을 누른다.

화면에 결과치가 mg/L iron으로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Section 1).*

REQUIRED REAGENTS & APPARATUS (Using Powder Pillows)

Description	Quantity Required Per Test	Unit	Cat. No.
TPTZ Iron Reagent Powder Pillows,	1 pillow	100/pkg	26087-99
Sample Cell, 10-20-25 mL, w/cap	1	6/pkg	24019-06

REQUIRED REAGENTS (Using AccuVac Ampuls)

TPTZ Iron Reagent AccuVac Ampuls	1 ampul	25/pkg	25100-25

REQUIRED APPARATUS (Using AccuVac Ampuls)

Beaker, 50 mL	1	each	500-41H
Sample Cell, 10-20-25 mL, w/cap	1	6/pkg	24019-06

OPTIONAL REAGENTS

Drinking Water Standard, Metals, LR (Cu, Fe, Mn)	500 mL		28337-49
Drinking Water Standard, Metals, HR (Cu, Fe, Mn)	500 mL		28336-49
Hydrochloric Acid Solution, 1:1, 6.0 N	500 mL		884-49
Iron Standard Solution, 100 mg/L Fe	100 mL		14175-42
Iron Standard Solution, Ampule, 25 mg/L Fe, 2 mL		20/pkg	24629-20
Nitric Acid, ACS	500 mL		152-49
Nitric Acid Solution, 1:1	500 mL		2540-49
RoVer Rust Remover	454 g		300-01
Sodium Hydroxide Standard Solution, 1.0 N	100 mL	MDB	1045-32
Sodium Hydroxide Standard Solution, 5.0 N	100 mL	MDB	2450-32
Sulfuric Acid Standard Solution	100 mL	MDB	1270-32
Water, deionized	4 L		272-56

OPTIONAL APPARATUS

Description	Unit	Cat. No.
AccuVac Snapper Kit	each	24052-00
Ampule Breaker, Ampules	each	24846-00
Cylinder, graduated, 25 mL	each	1081-40
Dropper, graduated, 0.5 and 1.0 mL marks	20/pkg	21247-20
Flask, volumetric, Class A, 250 mL	each	14574-46
pH Indicator Paper, 1 to 11 pH	5 rolls/pkg	391-33
pH Meter, *sension*™*1*, portable, with electrode	each	51700-10
Pipet Filler, safety bulb	each	14651-00
Pipet, serological, 2 mL	each	532-36
Pipet TenSette, 0.1 to 1.0 mL	each	19700-01
Pipet Tips, for 19700-01 TenSette Pipet	50/pkg	21856-96
Pipet, volumetric, Class A, 1.00 mL	each	14515-35

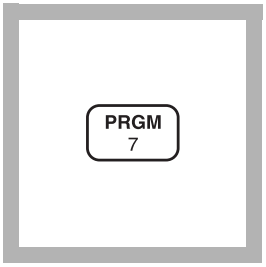
For Technical Assistance, Price and Ordering

In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

MANGANESE, High Range (0 to 20.0 mg/L)

Periodate Oxidation Method* USEPA approved for reporting wastewater analysis (digestion is required; see Section 2)**

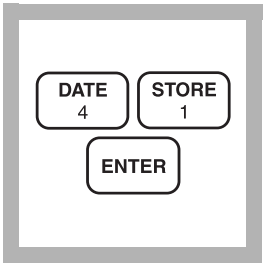


1. manganese, periodate oxidation method의 측정을 위해 번호를 선택한다.

Press: **PRGM**

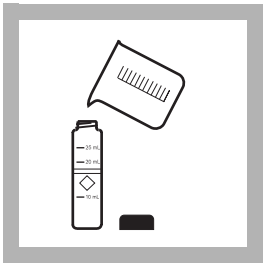
The display will show:

PRGM ?



2. 41번을 선택하고 **ENTER.** 화면에 **mg/L, Mn**과 **ZERO** 아이콘이 표시**.**

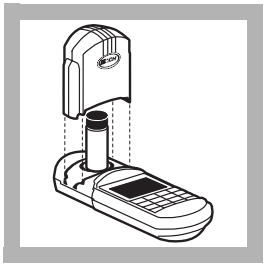
Note: *For alternate forms ($KMnO_4$, MnO_4), press the* **CONC** *key.*



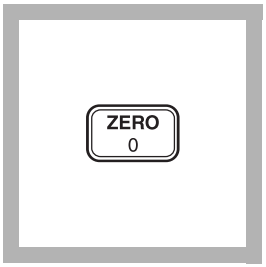
3. 샘플셀에 샘플을 10mL 채운다. (the blank)

Note: *For total manganese determination perform a digestion (see Section 2).*

Note: *Adjust the pH of stored samples before analysis.*



4. blank를 셀 홀더에 넣고 기기 덮개를 덮는다.

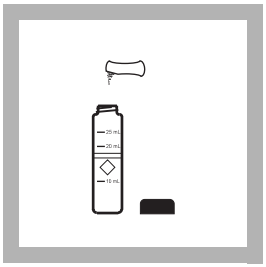


5. ZERO키를 누른다.

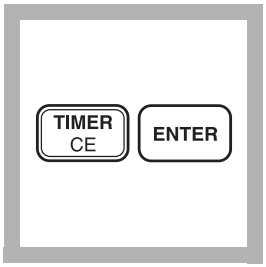
화면에 다음과 같이 나타난다:

0.0 mg/L Mn

6. 셀을 기기에서 꺼내서 뚜껑을 열고 Buffer Powder Pillow, citrate type을 첨가한다. 뚜껑을 닫고 파우더가 용해될 때 까지 흔들어 준다.



7. 뚜껑을 열고 Sodium Periodate Powder Pillow를 첨가한 후 다시 뚜껑을 닫고 10여초간 흔들어 섞어준다. (the prepared sample)



8. TIMER ENTER 입력

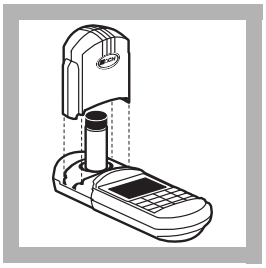
2분간 반응시간이 표시된다.

Note: *A violet color will form if manganese is present.*

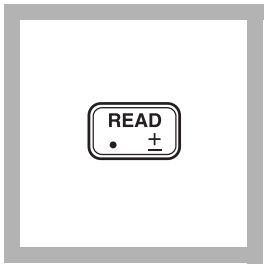
---

* Adapted from *Standard Methods for the Examination of Water and Wastewater.*

** *Federal Register*, 44 (116) 34193 (June 14, 1979).



9. 반응이 끝난 후 샘플 셀을 셀 홀더에 넣고 기기 덮개를 덮는다.



10. **READ**버튼을 누른다.

화면에 결과치가 mg/L manganese로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Section 1).*

REQUIRED REAGENTS

	Cat. No.
High Range Manganese Reagent Set (100 tests) 10 mL	24300-00
Includes: (1) 21076-69, (1) 21077-69	

Description	Quantity Required Per Test	Unit	Cat. No.
Buffer Powder Pillows, citrate type for Manganese	1 pillow	100/pkg	21076-69
Sodium Periodate Powder Pillows for Manganese	1 pillow	100/pkg	21077-69

REQUIRED APPARATUS

Sample Cell, 10-20-25 mL, w/cap	2	6/pkg	24019-06

OPTIONAL REAGENTS

Drinking Water Standard, Metals, HR (Cu, Fe, Mn)	500 mL	28336-49
Hydrochloric Acid, 6 N	500 mL	884-49
Manganese Standard Solution, 1000 mg/L Mn	100 mL	12791-42
Manganese Standard Solution, Voluette ampule, High Range, 250 mg/L Mn, 10 mL	16/pkg	14258-10
Nitric Acid, ACS	500 mL	152-49
Nitric Acid Solution 1:1	500 mL	2540-49
Sodium Hydroxide Solution, 5.0 N	100 mL MDB	2450-32
Water, deionized	4 L	272-56

OPTIONAL APPARATUS

Ampule Breaker Kit	each	21968-00
Flask, Erlenmeyer, 250 mL	each	505-46
Flask, volumetric, Class A, 50 mL	each	14574-41
Flask, volumetric, Class A, 100 mL	each	14574-42
Flask, volumetric, Class A, 1000 mL	each	14574-53
pH Indicator Paper, 1 to 11 pH	5 rolls/pkg	391-33
pH Meter, *sension*™*1*, portable, with electrode	each	51700-10
Pipet, serological, 5 mL	each	532-37
Pipet, TenSette, 0.1 to 1.0 mL	each	19700-01
Pipet, TenSette, 1.0 to 10.0 mL	each	19700-10
Pipet Tips, for 19700-01 TenSette Pipet	50/pkg	21856-96Pipet
Tips, for 19700-01 TenSette Pipet	1000/pkg	21856-28
Pipet Tips, for 19700-10 TenSette Pipet	50/pkg	21997-96
Pipet, volumetric, Class A, 5.00 mL	each	14515-37
Pipet, volumetric, Class A, 1.00 mL	each	14515-35
Pipet Filler, safety bulb	each	14651-00

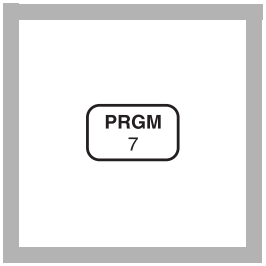
For Technical Assistance, Price and Ordering

In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

MANGANESE, Low Range (0 to 0.700 mg/L)

PAN Method*

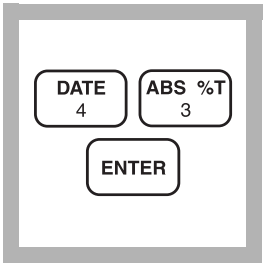


1. low range manganese 를 측정하기 위해 번호를 선택한다.

Press: **PRGM**

The display will show:

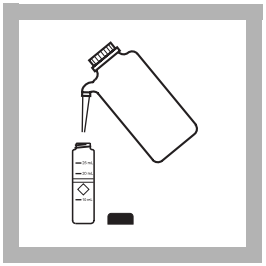
PRGM ?



2. 43번을 누르고 **ENTER.** 화면에 **mg/L, Mn**과 **ZERO** 아이콘이 표시.

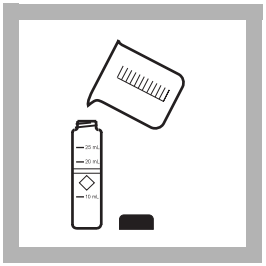
Note: *For alternate forms (MnO_4, $KMnO_4$), press the* **CONC** *key.*

Note: *Total manganese determination requires a prior digestion; see Digestion (Section 2).*

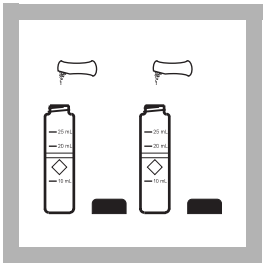


3. 샘플셀에 증류수를 10mL 채운다. (the blank)

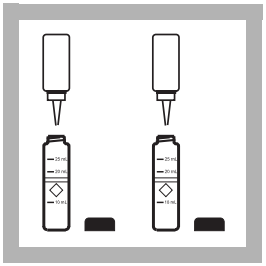
Note: *Rinse all glassware with 1:1 Nitric Acid Solution. Rinse again with deionized water.*



4. 다른 샘플셀에 샘플을 10mL 채운다. (the prepared sample)



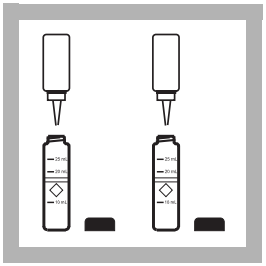
5. Ascorbic Acid Powder Pillow를 각 샘플셀에 넣고 휘저어 섞어준다.



6. 15방울의 Alkaline-Cyanide Reagent Solution을 각 셀에 넣고 섞어준다.

Note: *A cloudy solution may form in some samples after reagent addition. The turbidity should dissipate after Step 8.*

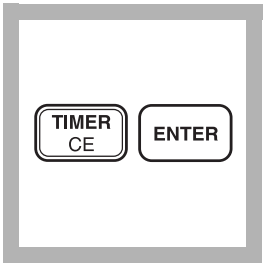
Note: *A Tensette Pipet may be used to dispense 0.4 mL of the Alkaline Cyanide Reagent.*



7. 21방울의 0.1% PAN Indicator Solution을 각 셀에 첨가하고 휘저어 섞어준다.

Note: *An orange color will develop in the sample if manganese is present.*

Note: *A Tensette Pipet may be used to dispense 0.4 mL of the PAN Indicator Solution.*

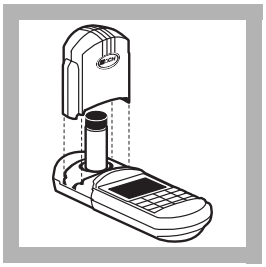


8. 다음버튼을 누른다:

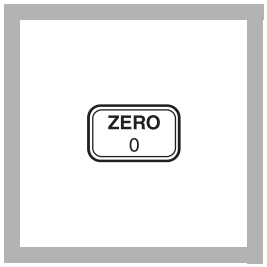
TIMER ENTER

2분간의 반응 시간이 표시된다.

* Adapted from Goto, K., et al., Talanta, 24, 752-3 (1977).



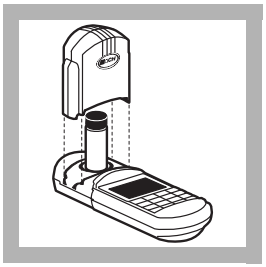
9. 타이머가 울린 뒤 blank를 셀 홀더에 넣고 기기 덮개를 덮어 준다.



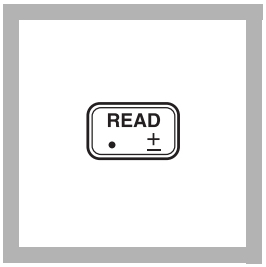
10. **ZERO**키를 누른다.

화면에 다음과 같이 나타난다:

0.000 mg/L Mn



11. 측정할 샘플을 셀 홀더에 넣고 기기 덮개를 덮는다.



12. **READ**키를 누른다.

화면에 결과치가 mg/L manganese로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Standard Adjust in Section 1).*

Note: *See Waste Management below for proper disposal of cyanide wastes.*

REQUIRED REAGENTS

	Cat. No.
Manganese Reagent Set (50 tests)	26517-00
Includes: (1) 21223-26, (1) 14577-99, (1) 21224-26	

Description	Quantity Required Per Test	Unit	Cat. No.
Alkaline-Cyanide Reagent	30 drops	50 mL SCDB	21223-26
Ascorbic Acid Powder Pillows	2 pillows	100/pkg	14577-99
PAN Indicator Solution, 0.1%	42 drops	50 mL SCDB	21224-26
Water, deionized	10 mL	4 L	272-56

REQUIRED APPARATUS

Cylinder, graduated, 25 mL	1	each	508-40
Sample Cell, 10-20-25 mL, w/cap	2	6/pkg	24019-06

OPTIONAL REAGENTS

Drinking Water Standard, Metals, LR (Cu, Fe, Mn)	500 mL	28337-49
Hydrochloric Acid Solution, 1:1 (6 N)	500 mL	884-49
Manganese Standard Solution, 1000 mg/L Mn	100 mL	12791-42
Manganese Standard Sol'n, Ampule, 25 mg/L Mn, 2 mL	20/pkg.	21128-20
Nitric Acid Solution, 1:1	500 mL	2540-49
Rochelle Salt Solution.	29 mL DB	1725-33
Sodium Hydroxide Solution, 50%	500 mL	2180-49
Nitric Acid, ACS	500 mL	152-49

OPTIONAL APPARATUS

Ampule Breaker, Ampule	each	24846-00
Beaker, glass, 1000 mL	each	500-53
Cylinder, graduated, mixing, 10 mL	each	20886-38
Dropper, plastic, calibrated, 1.0 mL	20/pkg	21247-20
Flask, volumetric, Class A, 1000 mL	each	14574-53
Flask, volumetric, Class A, 100 mL	each	14574-42
Pipet, TenSette, 0.1 to 1.0 mL	each	19700-01
Pipet Tips, for 19700-01 TenSette Pipet	50/pkg	21856-96
Pipet Tips, for 19700-01 TenSette Pipet	1000/pkg	21856-28
Pipet, volumetric, Class A, 10.0 mL	each	14515-38
Pipet, volumetric, Class A, 5.0 mL	each	14515-37
Pipet Filler, safety bulb	each	14651-00

For Technical Assistance, Price and Ordering

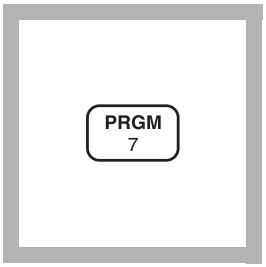
In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

MOLYBDENUM, MOLYBDATE, High Range (0 to 40.0 mg/L)

Mercaptoacetic Acid Method* — For water and wastewater

Using Powder Pillows



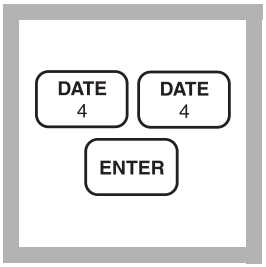
1. high range molybdenum의 powder pillows방식 측정을 위해 번호를 선택한다.

Press: **PRGM**

The display will show:

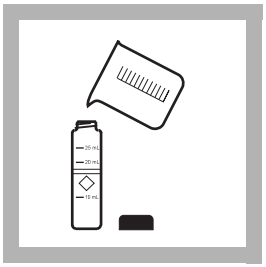
PRGM ?

Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*



2. 44번을 선택하고 **ENTER.** 화면에 **mg/L, Mo6**와 **ZERO** 아이콘이 표시.

Note: *For alternate form (MoO_4), press the* **CONC** *key.*

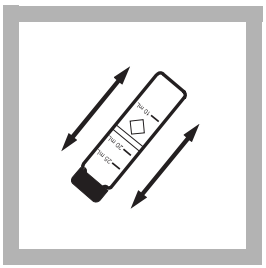


3. 샘플셀에 샘플을 10mL 채운다.

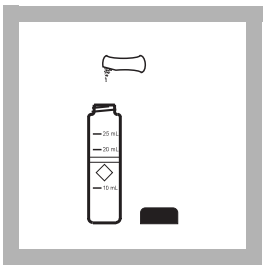
Note: *Filter turbid samples.*

Note: *Adjust pH of stored samples before analysis.*

4. MolyVer 1 Reagent Powder Pillow를 하나 첨가하고 여러번 흔들어 섞어준다.

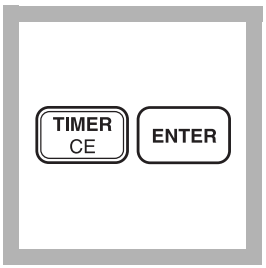


5. MolyVer 2 Reagent Powder Pillow를 하나 첨가하고 여러번 흔들어 섞어준다.



6. MolyVer 3 Reagent Powder Pillow를 하나 첨가하고 여러번 흔들어 섞어준다.

Note: *Accuracy is not affected by undissolved powder.*

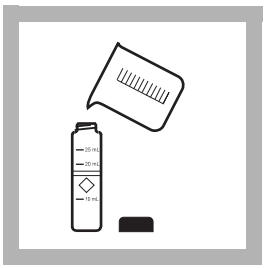


7. 다음 버튼을 누른다:

TIMER ENTER

5분간의 반응시간이 나타난다.

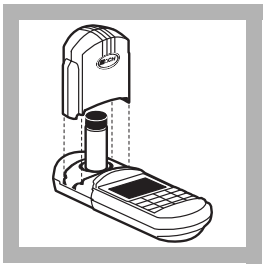
Note: *Molybdenum will cause a yellow color to form.*



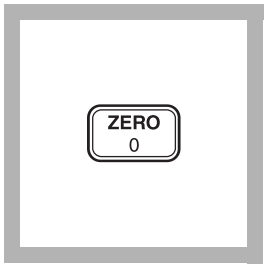
8. 타이머가 끝날 때 쯤 두번째 샘플셀에 샘플을 10mL 채운다. (the blank)

---

* Adapted from Analytical Chemistry, 25(9) 1363 (1953).



9. blank를 셀 홀더에 넣고 기기 덮개를 덮는다.

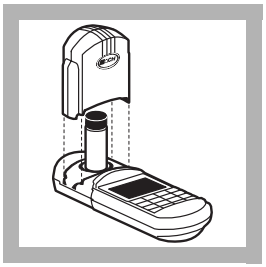


10. ZERO키를 누른다.

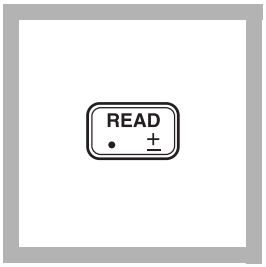
화면에 다음과 같이 나타난다:

0.0 mg/L Mo6

Note: *If Reagent Blank Correction is on, the display may flash "limit". See Section 1.*



11. 반응이 끝난 샘플을 셀 홀더에 넣고 기기 덮개를 덮는다.



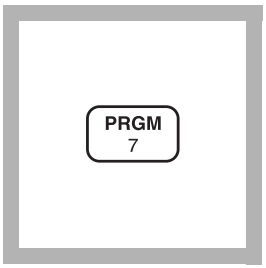
12. READ키를 누른다.

화면에 결과치가 mg/L molybdenum (또는 선택한 단위)로 나타난다.

Note: *Use of the Standard Adjust feature with each new lot of reagents is highly recommended. See Accuracy Check.*

Using AccuVac Ampuls

Method 10046



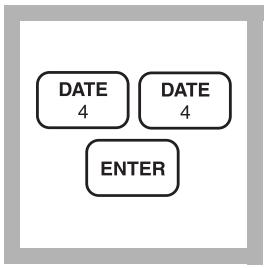
1. high range molybdenum의 AccuVac Ampuls방식 측정을 위해 번호를 선택한다.

Press: **PRGM**

The display will show:

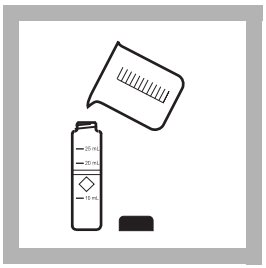
PRGM ?

Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*



2. 44번을 선택하고 **ENTER.** 화면에 **mg/L, Mo6**와 **ZERO** 아이콘이 표시.

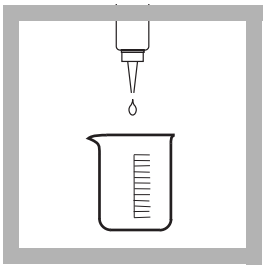
Note: *For alternate form (MoO_4), press the* **CONC** *key.*



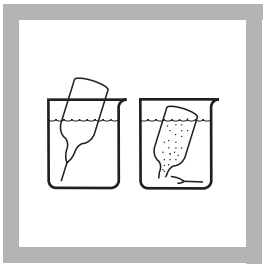
3. 샘플셀에 샘플을 10mL이상 채운다. (the blank) 비커에 40mL이상 샘플을 채운다.

Note: *Filter turbid samples.*

Note: *Adjust the pH of stored samples before analysis.*

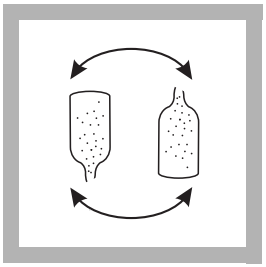


4. 0.4 M CDTA Solution을 4방울 비커에 첨가하고 휘저어 섞어준다.



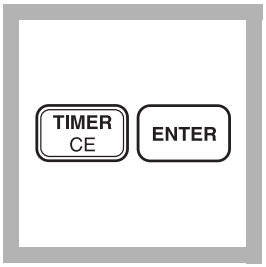
5. MolyVer 6 Reagent AccuVac Ampul에 샘플을 채운다.

Note: *Keep the tip immersed while the ampul fills.*



6. 엠퓰을 반복해서 뒤집어 섞어준다. 표면을 깨끗이 닦아준다.

Note: *Undissolved reagent will not affect the result.*

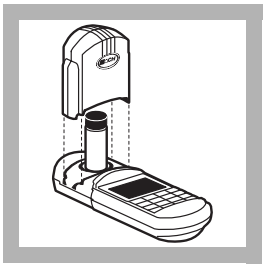


7. 다음 버튼을 누른다:

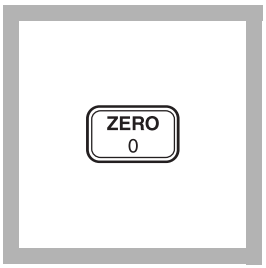
TIMER ENTER

5분간의 반응 시간이 표시된다.

Note: *If molybdenum is present a yellow color will develop.*



8. 타이머가 울린 뒤 blank 셀 홀더에 넣고 기기 덮개를 덮는다.

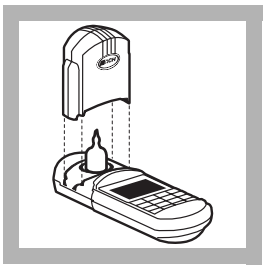


9. ZERO키를 누른다.

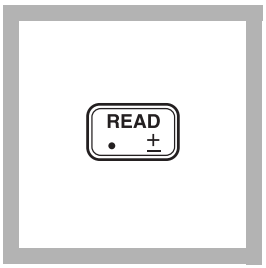
화면에 다음과 같이 나타난다:

0.0 mg/L Mo6

Note: *If Reagent Blank Correction is on, the display may flash "limit". See Section 1.*



10. 반응시간이 끝난 AccuVac Ampul을 셀 홀더에 넣고 기기 덮개를 덮는다.



11. READ키를 누른다.

화면에 결과치가 mg/L molybdenum으로 나타난다.

Note: *Use of the Standard Adjust feature with each new lot of reagent is highly recommended. See Accuracy Check.*

REQUIRED REAGENTS (for Powder Pillows)

	Cat. No.
Molybdenum Reagent Set, 10 mL (100 tests)	26041-00
Includes: (1) 26042-99, (1) 26043-99, (1) 26044-99	

Description	Quantity Required Per Test	Unit	Cat. No.
MolyVer 1 Reagent Powder Pillows	1 pillow	100/pkg	26042-99
MolyVer 2 Reagent Powder Pillows	1 pillow	100/pkg	26043-99
MolyVer 3 Reagent Powder Pillows	1 pillow	100/pkg	26044-99

REQUIRED REAGENTS (for AccuVac Ampuls)

MolyVer 6 Molybdenum AccuVac Reagent Set (25 tests)			25220-98
Includes: (1) 25220-25, (1) 26154-36			
CDTA Solution 0.4M	4 drops	15 mL SCDB	26154-36
MolyVer 6 Reagent AccuVac Ampuls	1 ampul	25/pkg	25220-25

REQUIRED APPARATUS (for Powder Pillows)

Sample Cell, 10-20-25 mL, w/cap	2	6/pkg	24019-06

REQUIRED APPARATUS (for AccuVac Ampuls)

Beaker, 50 mL	2	each	500-41H
Sample Cell, 10-20-25 mL, w/cap	1	6/pkg	24019-06

OPTIONAL REAGENTS

Molybdenum Standard Solution, 10 mg/L Mo^{6+}	100 mL	14187-42
Molybdenum Standard Solution, Voluette Ampule, 500 mg/L Mo^{6+}, 10 mL	16/pkg	14265-10
Nitric Acid, ACS	500 mL	152-49
Sodium Hydroxide Standard Solution, 5.0 N	100 mL MDB	2450-32
Sulfamic Acid Powder Pillows	100/pkg	1055-99
Water, deionized	4 L	272-56

OPTIONAL APPARATUS

AccuVac Snapper Kit	each	24052-00
Ampule Breaker Kit	each	21968-00
Cylinder, graduated, mixing, 25 mL	each	20886-40
Filter Paper, folded, 12.5 cm	100/pkg	1894-57
Flask, Erlenmeyer, 250 mL	each	505-46
Funnel, poly, 65 mm	each	1083-67
Pipet, serological, 5 mL	each	532-37
Pipet, TenSette, 0.1 to 1.0 mL	each	19700-01
Pipet Tips, for 19700-01 TenSette Pipet	50/pkg	21856-96
Pipet Tips, for 19700-01 TenSette Pipet	1000/pkg	21856-28

For Technical Assistance, Price and Ordering

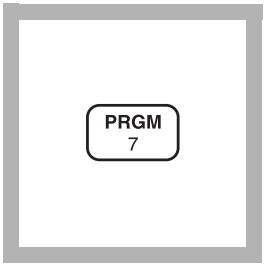
In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

MOLYBDENUM, MOLYBDATE, Low Range (0 to 3.00 mg/L)

Ternary Complex Method

For boiler and cooling tower waters



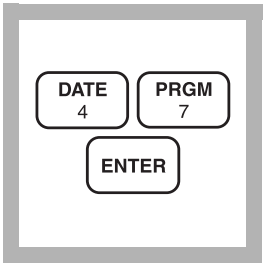
1. molybdate molybdenum 측정을 위해 번호를 선택한다.

Press: **PRGM**

The display will show:

PRGM ?

Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*



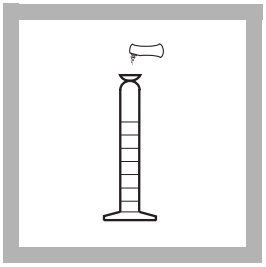
2. 47번을 선택하고

ENTER. 화면에 **mg/L, Mo6**와 **ZERO** 아이콘이 표시**.**

Note: *For alternate forms (MoO_4), press the* **CONC** *key.*

3. 25mL 눈금 실린더에 샘플을 20mL 채운다.

Note: *Filter turbid samples using the labware listed under Optional Apparatus.*

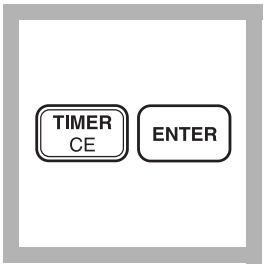


4. Molybdenum 1 Reagent Powder Pillow를 실린더에 첨가한다. 마개를 닫은 후 실린더를 뒤집어서 파우더를 용해 시킨다.

5. 수용액에서 10mL을 샘플셀에 옮겨 담는다.

6. 0.5 mL의 Molybdenum 2 Reagent를 샘플셀에 첨가하고 휘저어 섞어준다. (The prepared sample)

Note: *Molybdenum will cause a green color to form.*

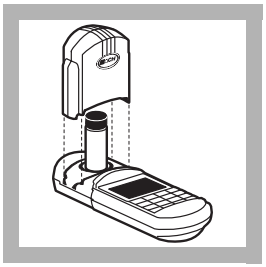


7. 다음 버튼을 누른다:

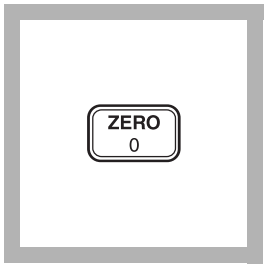
TIMER ENTER

2분간의 반응시간이 표시된다.

8. 두번째 샘플셀에 실린더에 남은 수용액 10mL을 옮겨 담는다. (the blank)



9. blank를 셀 홀더에 넣고 기기 덮개를 덮는다.

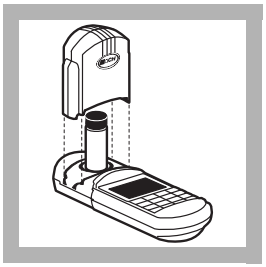


10. ZERO키를 누른다.

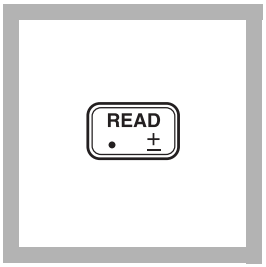
화면에 다음과 같이 나타난다:

0.00 mg/L Mo6

Note: *If Reagent Blank Correction is on, the display may flash "limit" (see Section 1).*



11. 반응 시간이 끝난 측정할 샘플을 셀홀더에 넣고 기기 덮개를 덮는다.



12. READ키를 누른다.

화면에 결과치가 mg/L molybdate molybdenum으로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Section 1).*

REQUIRED REAGENTS

Molybdenum Reagent Set, 20 mL sample (100 tests) 24494-00
Includes: (1) 23524-49, (1) 23525-12

Description	Quantity Required Per Test	Unit	Cat. No.
Molybdenum 1 Reagent for 20 mL sample size	1 pillow	100/pkg	23524-49
Molybdenum 2 Reagent Solution	0.5 mL	.50 mL MDB	23525-12

REQUIRED APPARATUS

Cylinder, mixing, graduated, 25 mL	1	each	1896-40
Sample Cell, 10-20-25 mL, w/cap	2	6/pkg	24019-06

OPTIONAL REAGENTS

Hydrochloric Acid Solution, 1:1, 6.0 N	500 mL	884-49
Molybdenum Standard Solution, Ampule 75 mg/L Mo^{6+}, 2 mL	20/pkg	25575-20
Molybdenum Standard Solution, 10 mg/L Mo^{6+}	100 mL	14187-42
Sodium Hydroxide Standard Solution, 1.0 N	100 mL MDB	1045-32
Water, deionized	4 L	272-56

OPTIONAL APPARATUS

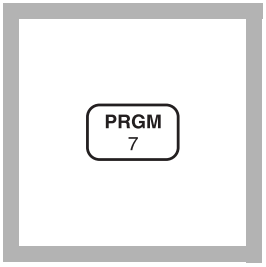
Description	Quantity Required Per Test	Unit	Cat. No.
Cylinder, mixing, graduated, 50 mL		each	1896-41
Filter Paper, folded, 12.5 cm		100/pkg	1894-57
Funnel, poly, 65 mm		each	1083-67
pH Paper, 1-11 pH units		5 rolls/pkg	391-33
Pipet, TenSette, 0.1 to 1.0 mL		each	19700-01
Pipet Tips, for 19700-01 TenSette Pipet		50/pkg	21856-96
Pipet, volumetric, 10.00 mL, Class A		each	14515-38
Pipet Filler, safety bulb		each	14651-00
PourRite Ampule Breaker		each	24846-00

For Technical Assistance, Price and Ordering

In the U.S.A. call 800-227-4224
Outside the U.S.A.—Contact the Hach office or distributor serving you.

NICKEL (0 to 1.000 mg/L)

PAN Method*

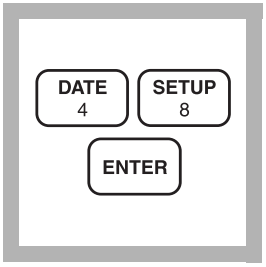


1. nickel (Ni), PAN method 측정을 위해 번호를 선택한다.

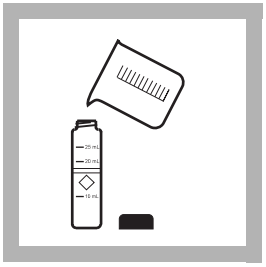
Press: **PRGM**

The display will show:

PRGM ?

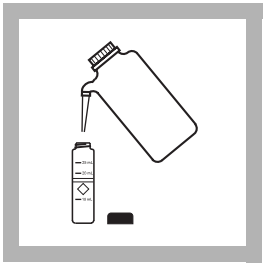


2. 48번을 선택하고 **ENTER.** 화면에 **mg/L, Ni**와 **ZERO** 아이콘이 표시.

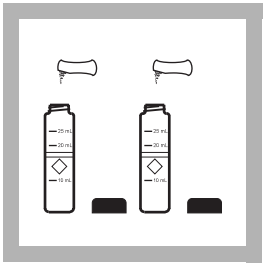


3. 샘플셀에 샘플을 25mL 채운다. (the prepared sample)

Note: *If sample is less than 10 °C (50 °F), warm to room temperature before analysis. Adjust the pH of stored samples.*

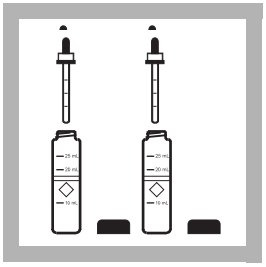


4. 두번째 샘플셀에 증류수를 25mL 채운다. (the blank)



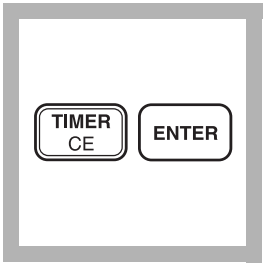
5. Phthalate-Phosphate Reagent Powder Pillow를 각 셀에 하나씩 첨가하고 수차례 뒤집어 섞어준다.

Note: *If sample contains iron (Fe^{3+}), all the powder must be dissolved completely before continuing with Step 6.*



6. 1.0 mL의 0.3% PAN Indicator Solution을 각 셀에 첨가하고 흔들어서 섞어준다.

Note: *Use the plastic dropper provided.*

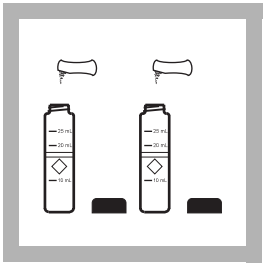


7. 다음 버튼을 누른다:

TIMER ENTER

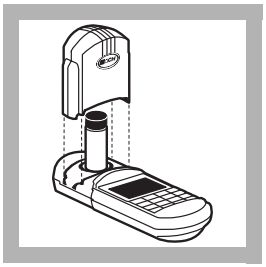
15분간의 반응 시간이 표시된다.

Note: *The sample solution color may vary from yellowish-orange to dark red. The blank should be yellow.*

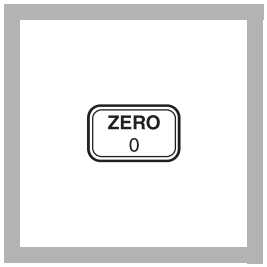


8. 타이머가 울린 후 EDTA Reagent Powder Pillow를 하나씩 각 셀에 첨가하고 여러번 흔들어서 섞어준다.

* Adapted from Watanabe, H., Talanta, 21 295 (1974)



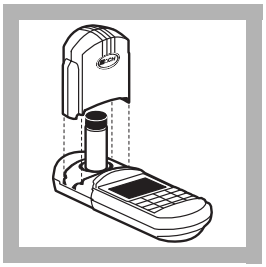
9. blank를 셀 홀더에 넣고 기기 덮개를 덮는다.



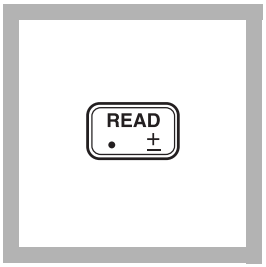
10. ZERO키를 누른다.

화면에 다음과 같이 나타난다:

0.000 mg/L Ni



11. 측정할 샘플을 셀 홀더에 넣고 기기 덮개를 덮는다.



12. READ키를 누른다.

화면에 결과치가 mg/L nickel로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Standard Adjust in Section 1).*

REQUIRED REAGENTS

	Cat. No.
Nickel Reagent Set, 25 mL sample (100 tests)	22426-00
Includes: (2) 7005-99, (4) 21501-66, (2) 21502-32	

Description	Quantity Required Per Test	Unit	Cat. No.
EDTA Reagent Powder Pillows	2 pillows	100/pkg	7005-99
Phthalate-Phosphate Reagent Powder Pillows	2 pillows	50/pkg	21501-66
P.A.N. Indicator Solution, 0.3%	2 mL	100 mL MDB	21502-32
Water, deionized	10 mL	4 L	272-56

REQUIRED APPARATUS

Clippers, for opening powder pillows	1	each	968-00
Cylinder, graduated, mixing, 25 mL	1	each	20886-40
Sample Cell, 10-20-25, w/caps	2	6/pkg	24019-06

OPTIONAL REAGENTS

Nickel Standard Solution, 1000 mg/L Ni	100 mL	14176-42
Nickel Standard Solution, Voluette Ampule, 300 mg/L Ni, 10 mL	16/pkg	14266-10
Nitric Acid, ACS	500 mL	152-49
Nitric Acid Solution, 1:1	500 mL	2540-49
Sodium Hydroxide Standard Solution, 5.0 N	100 mL MDB	2450-32

OPTIONAL APPARATUS

Ampule Breaker Kit	each	21968-00
Flask, volumetric, Class A, 100 mL	each	14574-42
Flask, volumetric, Class A, 1000 mL	each	14574-53
pH Paper, 1 to 11 pH units	5 rolls/pkg	391-33
pH Meter, *sension*™*1*, portable, with electrode	each	51700-10
Pipet, serological, 1 mL	each	9190-02
Pipet, serological, 5 mL	each	532-37
Pipet, TenSette, 0.1 to 1.0 mL	each	19700-01
Pipet Tips, for 19700-01 TenSette Pipet	50/pkg	21856-96
Pipet Tips, for 19700-01 TenSette Pipet	1000/pkg	21856-28
Pipet, volumetric, Class A, 5.0 mL	each	14515-37
Pipet, volumetric, Class A, 10.0 mL	each	14515-38
Pipet Filler, safety bulb	each	14651-00
Thermometer, –20 to 110 °C, non-mercury	each	26357-02

For Technical Assistance, Price and Ordering

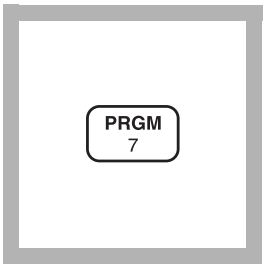
In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

NITRATE, High Range (0 to 30.0 mg/L NO_3^--N) For water, wastewater, and seawater*

Cadmium Reduction Method (Using Powder Pillows or AccuVac Ampuls)

Using Powder Pillows



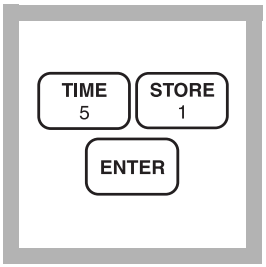
1. powder pillows 방식의 high range nitrate nitrogen (NO_3^-–N)측정을 위해 번호를 선택한다.

Press: **PRGM**

The display will show:

PRGM ?

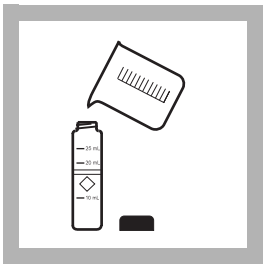
Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*



2. 51번을 선택하고

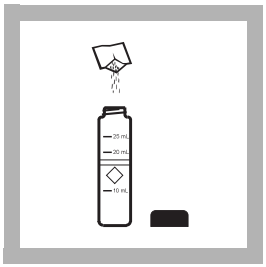
ENTER. 화면에 **mg/L, NO3-N**와 **ZERO** 아이콘이 표시.

Note: *For alternate forms (NO_3), press the* **CONC** *key.*



3. 샘플셀에 샘플을 10mL 채운다.

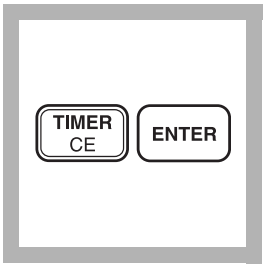
Note: *Adjust the pH of stored samples before analysis.*



4. NitraVer 5 Nitrate Reagent Powder Pillow 하나를 셀에 첨가한다. (the prepared sample) 뚜껑을 닫는다.

Note: *It is important to remove all of the powder from the foil pillow. Tap the pillow until no more powder pours out.*

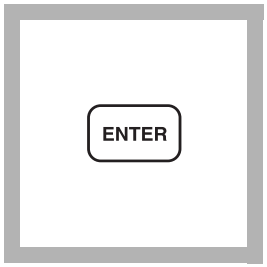
* Seawater requires a manual calibration; see Interferences.



5. 다음 버튼을 누른다:
TIMER ENTER

1분간의 타이머가 표시된다. 그 시간 동안 샘플셀을 매우 강하게 흔들어 준다.

Note: *It is important to shake the cell vigorously. Shaking time and technique influence color development. For most accurate results, do successive tests on a standard solution and adjust the shaking time to obtain the correct result.*



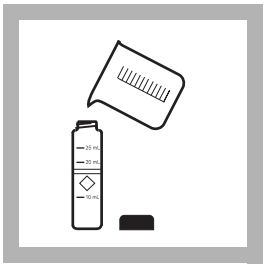
6. 타이머가 울린 후 다음처럼 표시된다:
5:00 TIMER 2

ENTER키를 누른다.

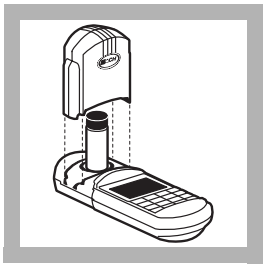
5분간의 반응 시간이 시작된다.

Note: *A deposit will remain after the reagent dissolves and will not affect test results.*

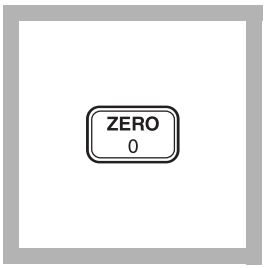
Note: *An amber color will develop if nitrate nitrogen is present.*



7. 다른 샘플셀에 샘플 10mL을 채운다. (the blank) 셀 표면을 깨끗이 닦아준다.



8. blank를 셀 홀더에 넣고 기기 덮개를 덮는다.

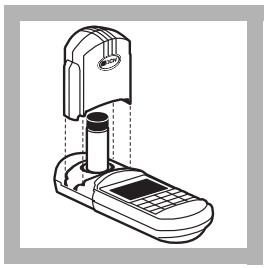


9. 타이머가 울린 후 **ZERO**키를 누른다**.**

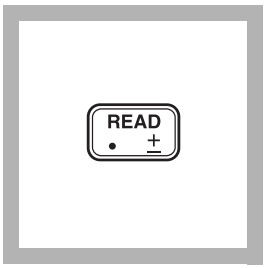
화면에 다음과 같이 나타난다:

0.0 mg/L NO3-N

Note: *If Reagent Blank Correction is on, the display may flash "limit". See Section 1.*



10. 반응 시간이 끝난 샘플을 셀 홀더에 넣고 기기 덮개를 덮는다.



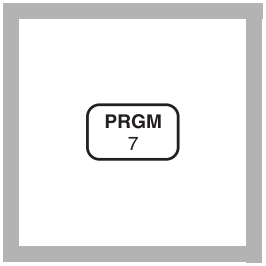
11. READ키를 누른다.

화면에 결과치가 mg/L NO_3-N (또는 선택한 단위)로 나타난다.

Note: *Use of the Standard Adjust feature for each new lot of reagent is highly recommended. See* Accuracy Check.

Note: *Rinse the sample cell immediately after use to remove all cadmium particles. Save the spent sample for proper hazardous waste disposal for cadmium.*

Using AccuVac Ampuls



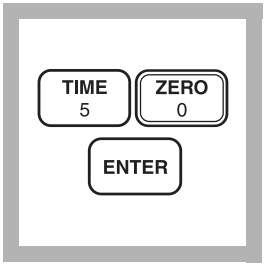
1. AccuVac Ampuls 방식의 high range nitrate nitrogen (NO_3^-–N)측정을 위해 번호를 선택한다.

Press: **PRGM**

The display will show:

PRGM ?

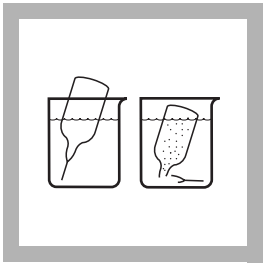
Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*



2. 50번을 선택하고

ENTER. 화면에 **mg/L, NO3-N**과 **ZERO** 아이콘이 표시.

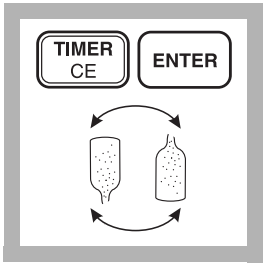
Note: *For alternate forms (NO_3), press the* **CONC** *key.*



3. 비커에 샘플을 40mL이상 채운다. NitraVer 5 Nitrate AccuVac Ampul에 샘플을 채운다. 앰퓰 입구에 마개를 씌운다.

Note: *Keep the tip immersed while the ampul fills. The ampul will not fill completely.*

Note: *Adjust the pH of stored samples before analysis.*

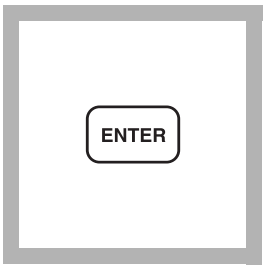


4. 다음 버튼을 누른다:

TIMER ENTER

1분간의 혼합시간이 표시된다. 타이머가 울릴 때까지 엠퓰을 뒤집어 준다. 엠퓰의 표면을 깨끗이 닦아준다.

Note: *Mixing time and technique influence color development. For most accurate results, do successive tests on a standard solution and adjust the mixing time to obtain the correct result.*



5. 화면에 다음과 같이 표시: **5:00 TIMER 2**

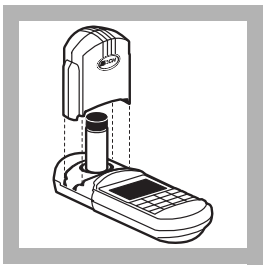
ENTER를 누른다.

5분간의 반응시간이 나타난다.

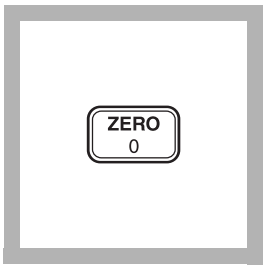
Note: *A deposit will remain after the reagent dissolves and will not affect results.*

Note: *An amber color will develop if nitrate nitrogen is present.*

6. 샘플셀에 샘플을 10mL이상 채운다. (the blank)



7. 타이머가 울린 후 blank를 셀 홀더에 넣고 기기 덮개를 덮는다.

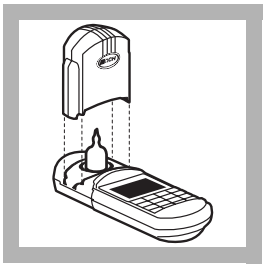


8. ZERO키를 누른다.

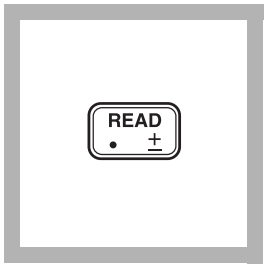
화면에 다음과 같이 나타난다:

0.0 mg/L NO3-N

Note: *If Reagent Blank Correction is on, the display may flash "limit". See Section 1.*



9. AccuVac Ampul을 셀 홀더에 넣고 기기 덮개를 덮는다.



10. READ키를 누른다.

화면에 결과치가 mg/L NO_3-N (또는 선택한 단위)로 나타난다.

Note: *Use of the Standard Adjust feature for each new lot of reagent is highly recommended. See* Accuracy Check.

Note: *See Pollution Prevention and Waste Management for proper disposal of cadmium.*

REQUIRED REAGENTS & APPARATUS (Using Powder Pillows)

Description	Quantity Required Per Test	Unit	Cat. No.
NitraVer 5 Nitrate Reagent Powder Pillows	1 pillow	100/pkg	21061-69
Sample Cell, 10-20-25 mL, w/cap	2	6/pkg	24019-06

REQUIRED REAGENTS (Using AccuVac Ampuls)

NitraVer 5 Nitrate Reagent AccuVac Ampul	1 ampul	25/pkg	25110-25

REQUIRED APPARATUS (Using AccuVac Ampuls)

Beaker, 50 mL	1	each	500-41H
Stopper	1	6/pkg	1731-06

OPTIONAL REAGENTS

Bromine Water 30 g/L	29 mL*	2211-20
Nitrate Nitrogen Standard Solution, 10.0 mg/L as (NO_3^--N)	500 mL	307-49
Nitrate Nitrogen Standard Solution, 1000 mg/L as (NO_3^--N)	500 mL	12792-49
Nitrate Nitrogen Standard Solution, PourRite ampule, 500 mg/L as NO_3^--N, 2 mL	20/pkg	14260-20
Phenol Solution	29 mL	2112-20
Sodium Hydroxide Standard Solution, 5.0 N	50 mL*	2450-26
Sulfuric Acid, ACS	500 mL*	979-49
Water, deionized	4 L	272-56

OPTIONAL APPARATUS

AccuVac Snapper Kit	each	24052-00
Cylinder, graduated, mixing, 25 mL	each	1896-40
Dropper, for 29-mL bottle	each	2258-00
pH Indicator Paper, 1 to 11 pH	5 rolls/pkg	391-33
pH Meter, *sension*™*1*, portable, with electrode	each	51700-10
Pipet Filler, safety bulb	each	14651-00
Pipet, serological, 2 mL	each	532-36
Pipet, TenSette, 0.1 to 1.0 mL	each	19700-01
Pipet Tips, for 19700-01 TenSette Pipet	50/pkg	21856-96
Pipet Tips, for 19700-01 TenSette Pipet	1000/pkg	21856-28
PourRite Ampule Breaker	each	24846-00
Thermometer, –20 to 110 °C, non-mercury	each	26357-02

For Technical Assistance, Price and Ordering

In the U.S.A. call 800-227-4224

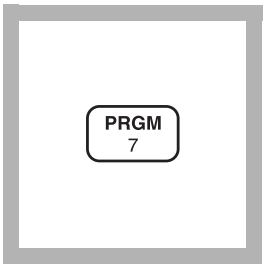
Outside the U.S.A.—Contact the Hach office or distributor serving you.

* Contact Hach for larger sizes.

NITRATE, Mid Range (0 to 5.0 mg/L NO_3^--N) For water, wastewater and seawater*

Cadmium Reduction Method (Using Powder Pillows or AccuVac Ampuls)

Using Powder Pillows



1. medium range nitrate nitrogen의 powder pillows방식 측정을 실행하기 위해 번호를 선택한다.

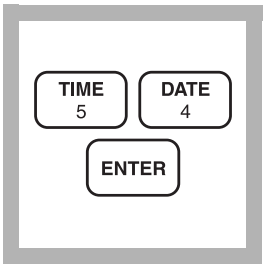
Press: **PRGM**

The display will show:

PRGM ?

Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*

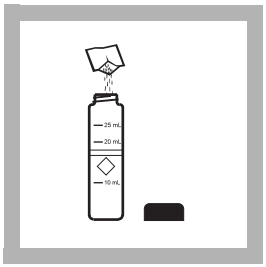
Note: *Adjust the pH of stored samples before analysis.*



2. 54번을 선택하고 **ENTER.** 화면에 **mg/L, NO3-N**과 **ZERO** 아이콘이 표시.

Note: *For alternate form (NO_3), press the* **CONC** *key.*

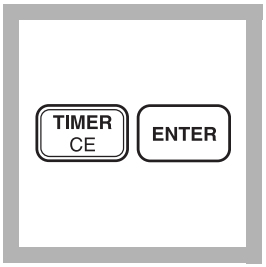
3. 샘플셀 두개에 샘플 10mL씩 채운다.
한 셀은 측정할 샘플이 되고, 한 셀은 blank가 된다. blank를 한쪽에 따로 둔다.



4. NitraVer 5 Nitrate Reagent Powder Pillow 하나를 샘플셀 하나에 첨가하고 마개를 닫는다. (the prepared sample)

Note: *It is necessary to remove all the powder from the foil pouch by tapping repeatedly until no more powder comes out.*

* Seawater requires a manual calibration; see *Interferences*.

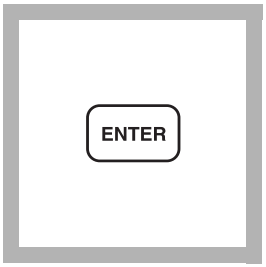


5. 다음 버튼을 누른다:

TIMER ENTER

1분간의 반응시간이 표시된다. 반응시간 동안 샘플셀을 강하게 흔들어 준다.

Note: *Shaking time and technique influence color development. Low results usually occur if shaking is not vigorous enough. For most accurate results, do successive tests on a standard solution and adjust the shaking time by ±1 minute to obtain the correct result. See the Accuracy Check section for more information.*



6. 타이머가 울린 후 화면에 다음처럼 표시:
5:00 TIMER 2

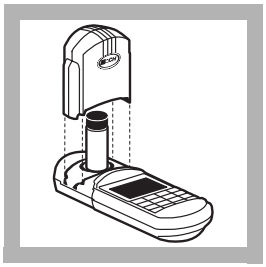
ENTER키를 누른다.

5분간의 반응시간이 나타난다.

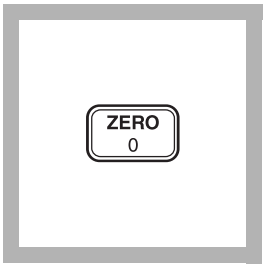
Note: *A cadmium deposit will remain after the NitraVer 5 Nitrate Reagent Powder dissolves and will not affect test results.*

Note: *An amber color will develop if nitrate nitrogen is present.*

7. 타이머가 울린 후 셀의 표면을 깨끗이 닦아준다.



8. blank를 셀 홀더에 넣고 기기 덮개를 덮는다.

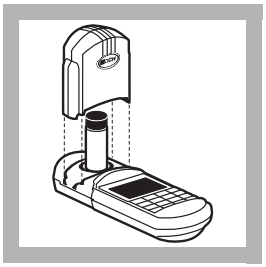


9. ZERO키를 누른다.

화면에 다음과 같이 표시된다:

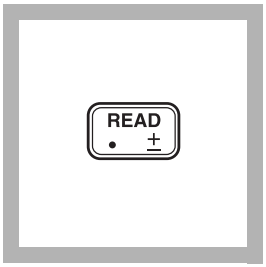
0.0 mg/L NO3-N

Note: *If Reagent Blank Correction is on, the display may flash "limit".*



10. 측정할 샘플을 셀 홀더에 넣고 기기 덮개를 덮는다.

Note: *Read the sample within two minutes after the timer beeps.*



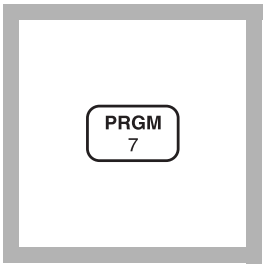
11. READ키를 누른다.

화면에 결과치가 mg/L NO_3-N (또는 NO_3)로 나타난다.

Note: *Use of the standard adjust feature with each new lot of reagent is highly recommended. See Accuracy Check.*

Note: *Rinse the sample cell immediately after use to remove all the cadmium particles. See Pollution Prevention and Waste Management following these steps for disposal of cadmium particles.*

Using AccuVac Ampuls



1. stored program에서 medium range nitrate nitrogen의 AccuVac Ampuls사용 측정법의 번호를 선택한다.

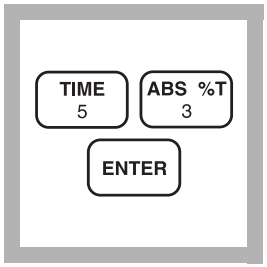
Press: **PRGM**

The display will show:

PRGM ?

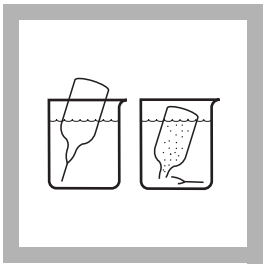
Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*

Note: *Adjust the pH of stored samples before analysis.*



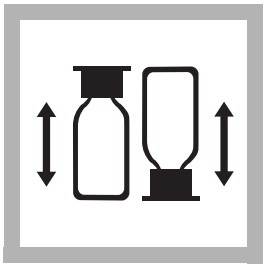
2. 53번을 선택하고 **ENTER.** 화면에 **mg/L, NO3-N**와 **ZERO** 아이콘이 표시.

Note: *For alternate form (NO_3), press the* **CONC** *key.*



3. 비커에 샘플을 40 mL 이상 채운다. NitraVer 5 Nitrate AccuVac Ampul에 샘플을 채운다. 앰퓰에 마개를 끼운다.

Note: *Keep the tip immersed while the ampul fills. The ampul will not fill completely to allow room for mixing.*

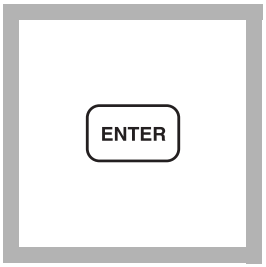


4. 다음 버튼을 누른다:

TIMER ENTER

1분간의 혼합 시간이 표시된다. 타이머가 울릴 때 까지 엠퓰을 반복해서 뒤집어 준다. 혼합이 끝난 후 앰퓰의 표면을 깨끗이 닦아준다.

Note: *Mixing speed and technique influence color development. For most accurate results, do successive tests on a standard solution and increase or decrease the mixing time to obtain the correct result. See Accuracy Check for more information.*



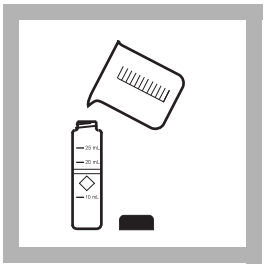
5. 타이머가 울린 후 화면에 다음처럼 표시:
05:00 Timer 2

ENTER키를 누른다.

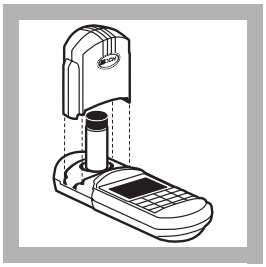
5분간의 반응시간이 표시된다.

Note: *A cadmium deposit will remain after the NitraVer 5 Nitrate Reagent Powder dissolves and will not affect results.*

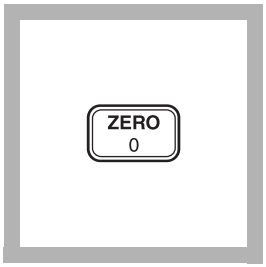
Note: *An amber color will develop if nitrate nitrogen is present.*



6. 샘플셀에 샘플을 10mL이상 채운다. (the blank)



7. 타이머가 울린 후 blank를 셀 홀더에 넣고 기기 덮개를 덮는다.

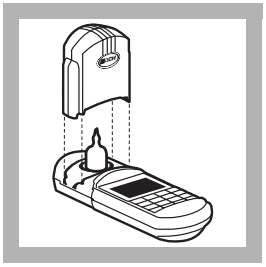


8. ZERO키를 누른다.

화면에 다음과 같이 나타난다:

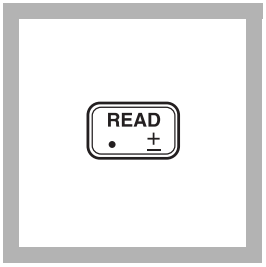
0.0 mg/L NO3-N

Note: *If Reagent Blank Correction is on, the display may flash "limit". See Section 1.*



9. 반응시간이 끝난 후 AccuVac ampul을 셀 홀더에 넣고 기기 덮개를 덮는다.

Note: *Read the sample within two minutes after the timer beeps.*



10. READ키를 누른다.

화면에 결과치가 mg/L NO_3-N (또는 NO_3)으로 나타난다.

Note: *Use of the standard adjust feature with each new lot of reagent is highly recommended. See Accuracy Check.*

REQUIRED REAGENTS AND APPARATUS (Using Powder Pillows)

Description	Qty/ Test	Unit	Cat. No.
NitraVer 5 Nitrate Reagent Powder Pillows	1 pillow	100/pkg	21061-69
Sample Cell, 10-20-25 mL, w/ caps	2	6/pkg	24019-06

REQUIRED REAGENTS (Using AccuVac Ampuls)

NitraVer 5 Nitrate Reagent AccuVac Ampul	1 ampul	25/pkg	25110-25

REQUIRED APPARATUS (Using AccuVac Ampuls)

Beaker, 50 mL	1	each	500-41
Stopper	1	6/pkg	1731-06

OPTIONAL REAGENTS

Bromine Water 30 g/L	29 mL*		2211-20
Drinking Water Standard, Inorganics, (Fe^{-}, NO_3^{-}, SO_4^{2-}, PO_4^{3-})	500 mL		28330-49
Nitrate Nitrogen Standard Solution, 1.0 mg/L as NO_3^{-}-N	500 mL		2046-49
Nitrate Nitrogen Standard Solution, 100 mg/L as NO_3^{-}-N	500 mL		1947-49
Nitrate Nitrogen Standard Solution, PourRite Ampule, 100 mg/L as NO_3^{-}-N, 2 mL	20/pkg		1947-20
Phenol Solution, 30 g/L	29 mL		2112-20
Sodium Hydroxide Standard Solution, 5.0 N	50 mL SCDB*		2450-26
Sulfuric Acid, ACS	500 mL*		979-49
Water, deionized	4 L		272-56

OPTIONAL APPARATUS

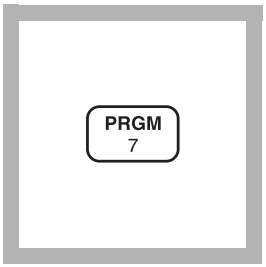
AccuVac Snapper Kit	each		24052-00
Cylinder, graduated, mixing, 25 mL	each		20886-40
Dropper, for 1-oz bottle	each		2258-00
pH Paper, 1 to 11 pH units	5 rolls/pkg		391-33
pH Meter, *sension*™*1*, portable, with electrode	each		51700-10
Pipet Filler, safety bulb	each		14651-00
Pipet, serological, 2 mL	each		532-36
Pipet, TenSette, 0.1 to 1.0 mL	each		19700-01
Pipet Tips, for 19700-01 TenSette Pipet	50/pkg		21856-96
Pipet Tips, for 19700-01 TenSette Pipet	1000/pkg		21856-28
PourRite Ampule Breaker	each		24846-00

* Contact Hach for larger sizes.

NITRATE, Low Range (0 to 0.50 mg/L NO_3^--N)

For water, wastewater and seawater*

Cadmium Reduction Method



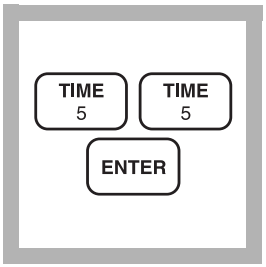
1. low range nitrate nitrogen 측정을 위해 번호를 선택한다. (NO_3^--N).

Press: **PRGM**

The display will show:

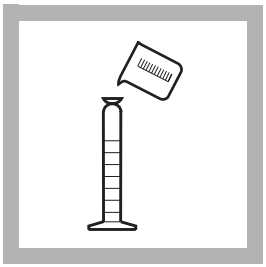
PRGM ?

Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*



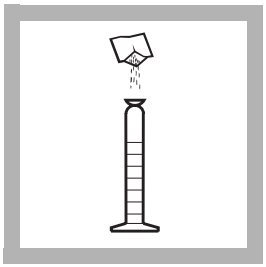
2. 55번을 선택하고 **ENTER.** 화면에 **mg/L, NO3-N**과 **ZERO** 아이콘이 표시.

Note: *For alternate forms (NO_3), press the* **CONC** *key.*



3. 25mL 눈금 실린더에 샘플을 15mL 채운다.

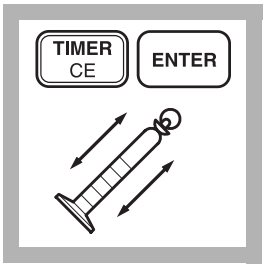
Note: *Adjust the pH of stored samples before analysis.*



4. NitraVer 6 Nitrate Reagent Powder Pillow 하나를 실린더에 첨가하고 마개를 닫는다.

Note: *It is necessary to remove* ***all*** *the powder from the foil pillow. Tap the pillow until no more powder pours out. Be sure to remove powder from the corners of the pillow.*

* Seawater requires a manual calibration; see Interferences.

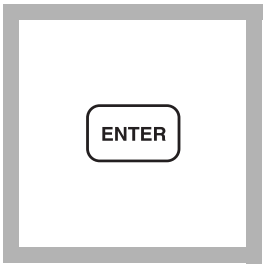


5. 다음 버튼을 누른다:

TIMER ENTER

3분간의 타이머가 표시된다. 이 시간동안 실린더를 매우 강하게 흔들어 준다.

Note: *Shaking time and technique influence color development. For most accurate results, analyze a standard solution several times and adjust the shaking time to obtain the correct result.*

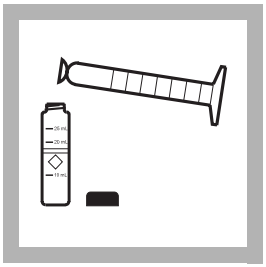


6. 타이머가 울리면 화면에 다음과 같이 표시: **2:00 TIMER 2**

ENTER키를 누른다.

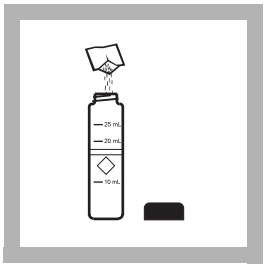
2분간의 반응 시간이 나타난다.

Note: *A deposit will remain after the powder dissolves and will not affect results.*



7. 타이머가 울리면 실린더의 샘플을 샘플셀에 10mL 옮겨 담는다.

Note: *Do not transfer any cadmium particles.*



8. NitriVer 3 Nitrite Reagent Powder Pillow 하나를 샘플셀에 첨가한다. (the prepared sample). 뚜껑을 닫고 30여초간 부드럽게 흔들어 섞어준다.

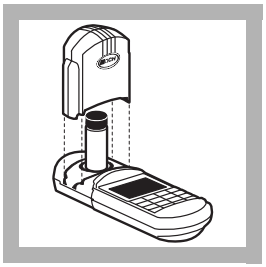
Note: *A pink color will form if nitrate is present.*

9. 화면에 다음처럼 표시: **15:00 TIMER 3**

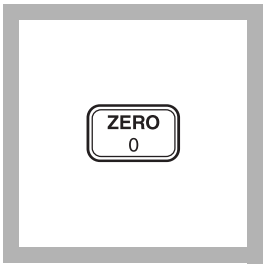
ENTER키를 누른다.

15분간의 반응시간이 시작된다.

다른 샘플셀에 샘플을 10mL 채운다.
(the blank)



10. 타이머가 울린 후 blank를 셀 홀더에 넣고 기기 덮개를 덮는다.

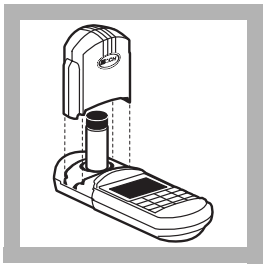


11. **ZERO**키를 누른다.

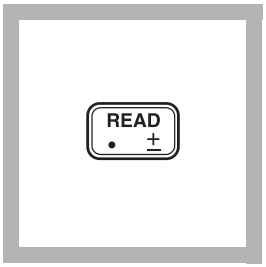
화면에 다음과 같이 표시된다:

0.00 mg/L NO3-N

Note: *If Reagent Blank Correction is on, the display may flash "limit". See Section 1.*



12. 반응시간이 끝난 측정할 샘플을 셀 홀더에 넣고 기기 덮개를 덮는다.



13. **READ**키를 누른다.

화면에 결과치가
mg/L NO_3^--N
(또는 선택한 단위)로
나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Section 1).*

Note: *Rinse the sample cell and cylinder immediately after use to remove all cadmium particles.*

Note: *See Pollution Prevention and Waste Management for proper disposal of cadmium.*

REQUIRED REAGENTS

Low Range Nitrate Reagent Set (100 tests) 24298-00
Includes: (1) 21071-69, (1) 21072-49

Description	Quantity Required Per Test	Unit	Cat. No.
NitriVer 3 Nitrite Reagent Powder Pillows	1 pillow	100/pkg	21071-69
NitraVer 6 Nitrate Reagent Powder Pillows	1 pillow	100/pkg	21072-49

REQUIRED APPARATUS

Cylinder, graduated, mixing, 25 mL	1	each	1896-40
Sample Cell, 10-20-25 mL, w/ cap	2	6/pkg	24019-06

OPTIONAL REAGENTS

Description	Unit	Cat. No.
Bromine Water, 30 g/L	29 mL*	2211-20
Nitrate Nitrogen Standard Solution, 10.0 mg/L as NO_3^--N	500 mL	307-49
Nitrate Nitrogen Standard Solution, Voluette ampule, 12 mg/L as NO_3^--N, 10 mL	16/pkg	14333-10
Phenol Solution, 30 g/L	29 mL	2112-20
Pretreatment Kit, contains: (1) 2112-20, (1) 2211-20	each	2268-00
Sodium Hydroxide Standard Solution, 5.0 N	50 mL* SCDB	2450-26
Sulfuric Acid, ACS	500 mL*	979-49
Water, deionized	4 L	272-56

OPTIONAL APPARATUS

Ampule Breaker	each	21968-00
Dropper, for 29-mL bottle	each	2258-00
Flask, volumetric, Class A, 100 mL	each	14574-42
pH Indicator Paper, 1 to 11 pH	5-roll/pkg	391-33
pH Meter, *sension*™*1*, portable, with electrode	each	51700-10
Pipet, serological, 2 mL	each	532-36
Pipet, TenSette, 0.1 to 1.0 mL	each	19700-01
Pipet Tips, for 19700-01 TenSette Pipet	50/pkg	21856-96
Pipet Tips, for 19700-01 TenSette Pipet	1000/pkg	21856-28
Pipet, volumetric, Class A, 2.00 mL	each	14515-36
Pipet Filler, safety bulb	each	14651-00
Thermometer, –20 to 110 °C	each	26357-02

Nitrate at these levels can also be determined directly using the Nitrate Ion Selective Electrode (Cat. No. 23488-00).

For Technical Assistance, Price and Ordering

In the U.S.A.—Call 800-227-4224
Outside the U.S.A.—Contact the Hach office or distributor serving you.

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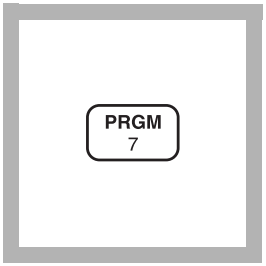
* Contact Hach for larger sizes

NITRATE, High Range, Test ‘N Tube (0 to 30.0 mg/L NO_3^--N)

Chromotropic Acid Method

For water and wastewater



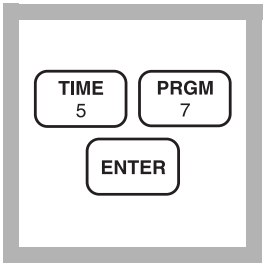
1. Test 'N Tube nitrate nitrogen 항목의 측정 번호를 선택하도록 한다. (NO_3^--N).

Press: **PRGM**

The display will show:

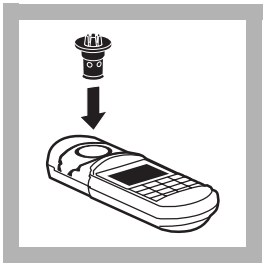
PRGM ?

Note: *If samples cannot be analyzed immediately, see Sampling and Storage on page 321.*



2. 57번을 선택하고 **ENTER.** 화면에 **mg/L, NO3-N**와 **ZERO** 아이콘이 표시**.**

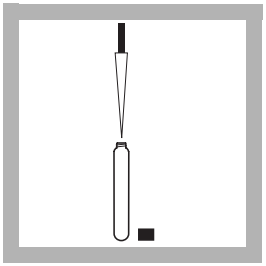
Note: *For alternate forms (NO_3) press the* **CONC** *key.*



3. COD/TNT 아답타를 기기에 맞춰 끼운다.

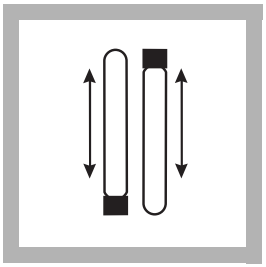
Note: *For proof of accuracy, use a 20 mg/L NO_3^--N standard in place of the sample.*

Note: *For increased performance, a diffuser band covers the light path holes on the adapter. Do not remove the diffuser band.*



4. Nitrate Pretreatment Solution Vial의 뚜껑을 열고 샘플을 1mL 넣는다. (the blank)

Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*

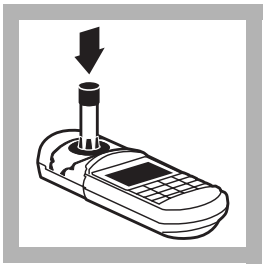


5. 뚜껑을 닫고 10회 가량 흔들어 섞어준다.

Note: *This test is technique-sensitive. Low results may occur if these instructions are not followed. Hold the vial vertical with the cap up. Invert the vial so the cap points down. Wait for all of the solution to flow to the cap end. Pause. Return the vial to the upright position. Wait for all the solution to flow to the vial bottom. This process equals 1 inversion. Do this 10 times.*

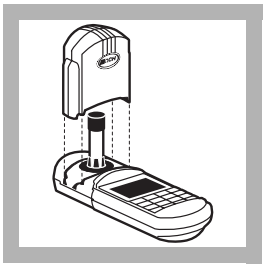
6. 바이알의 표면을 깨끗이 닦아준다.

Note: *Wipe with a damp towel and follow with a dry one to remove fingerprints and other marks.*

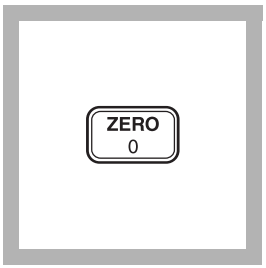


7. blank를 하크 로고가 정면으로 오게 해서 아답타에 맞춰 끼운다.

Note: *Do not move the vial from side to side as this can cause errors.*



8. 바이알 위에 기기 덮개를 덮는다.

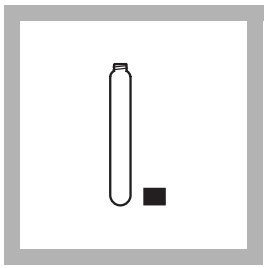


9. ZERO키를 누른다.

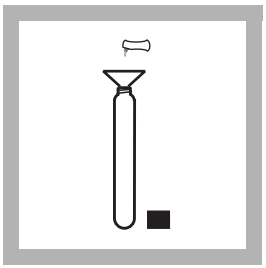
화면에 다음처럼 표시된다:

0.0 mg/L NO3-N

Note: *If Reagent Blank Correction is on, the display may flash “limit”. See Section 1.*



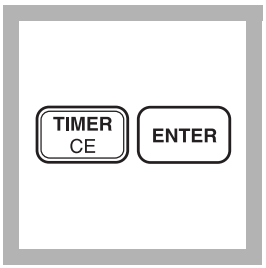
10. 바이알을 기기에서 꺼내서 뚜껑을 연다.



11. NitraVer X Reagent B Powder Pillow를 하나 바이알에 첨가하고 10회 정도 뒤집어서 섞어준다.
이 수용액이 측정할 샘플이 된다.

Note: *See Step 5 for inversion instructions*

Note: *Some solid matter will not dissolve.*



12. 다음 버튼을 누른다:

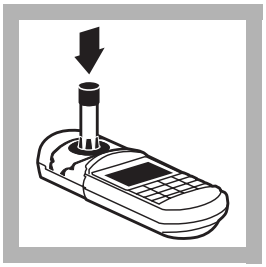
TIMER ENTER

5분간의 반응시간이 표시된다. 바이알을 다시 뒤집지 않도록 한다.

Note: *A yellow color will develop if nitrate nitrogen is present.*

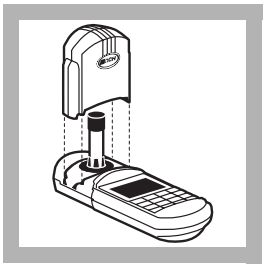
Note: *Complete Steps 13-16 within five minutes after the timer beeps.*

13. 타이머가 울린 뒤 바이알의 표면을 깨끗이 닦아주도록 한다.

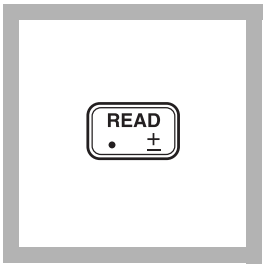


14. 측정할 샘플을 하크 로고가 정면으로 오게 해서 아답타에 맞춰 끼운다.

Note: *Do not move the vial from side to side as this can cause errors.*



15. 바이알 위에 기기 덮개를 덮어준다.



16. **READ**키를 누른다.

화면에 결과치가 mg/L nitrate nitrogen (NO_3-N)으로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Standard Adjust in Section 1).*

REQUIRED REAGENTS

	Cat. No.
NitraVer X Nitrate, High Range Test ‘N Tube Reagent Set (50 tests)	26053-45
Includes: (1) 26055-46, (1) 272-42, *(50) Nitrate Pretreatment Solution Vials	

Description	Quantity Required Per Test	Unit	Cat. No.
Nitrate Pretreatment Solution Vials	1	50/pkg	*
NitraVer X Reagent B Powder Pillows	1	50/pkg	26055-46

REQUIRED APPARATUS

COD Vial Adapter	1	each	48464-00
Funnel, micro	1	each	25843-35
Pipet, TenSette, 0.1 to 1.0 mL	1	each	19700-01
Pipet Tips, for 19700-01 TenSette Pipet	varies	50/pkg	21856-96
Test Tube Rack	1-3	each	18641-00

OPTIONAL REAGENTS

Nitrate-Nitrogen Standard Solution, Voluette Ampules, 500 mg/L N	16/pkg	14260-10
Sodium Hydroxide Standard Solution, 5.0 N	50 mL	2450-26
Sulfuric Acid, ACS, concentrated	500 mL	979-49
Urea, ACS	100 g	11237-26
Water, deionized	4 L	272-56

OPTIONAL APPARATUS

Ampule Breaker Kit	each	21968-00
Cylinder, graduated, mixing, 25-mL (3 required)	each	26363-40
Flask, volumetric, Class A, 50 mL	each	14574-41
pH Paper, 1 to 11 pH units	5 rolls/pkg	391-33
Pipet, volumetric, Class A, 2 mL	each	14515-36
Pipet Tips, for 19700-01 TenSette Pipet	1000/pkg	21856-28
Spoon, measuring, 0.5 g	each	907-00

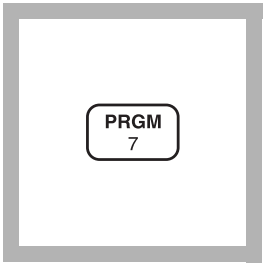
For Technical Assistance, Price and Ordering

In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

* Not available separately.

Ferrous Sulfate Method*



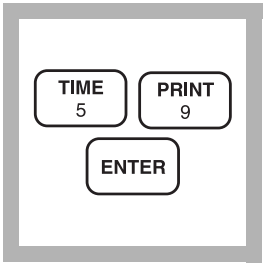
1. 다음 항목의 실험을 위해 번호를 선택한다: high range nitrite (NO_2^-).

Press: **PRGM**

The display will show:

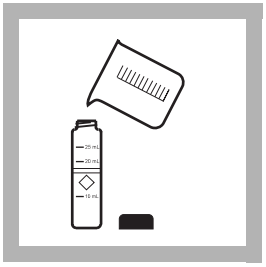
PRGM ?

Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*



2. 59번을 선택하고 **ENTER.** 화면에 **mg/L, NO2** 와 **ZERO** 아이콘이 표시.

Note: *For alternate forms (NO_2-N, $NaNO_2$), press the* **CONC** *key.*

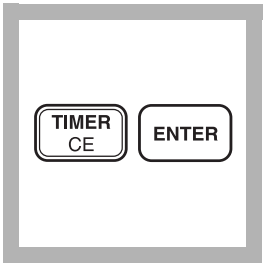


3. 샘플셀에 샘플을 10mL 채운다.

4. NitriVer 2 Nitrite Reagent Powder Pillow 를 하나 셀에 첨가한다. 뚜껑을 닫고 5~7회 정도 뒤집어서 섞어준다.(the prepared sample)

Note: *A greenish-brown color will develop if nitrite is present.*

Note: *Avoid excessive mixing or low results may occur. Accuracy is not affected by undissolved powder.*

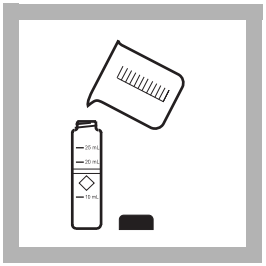


5. 다음 버튼을 누른다:

TIMER ENTER

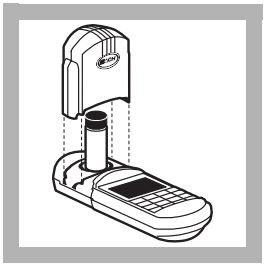
10분간의 반응시간이 표시된다.

반응시간 동안 셀을 가만히 두도록 한다.

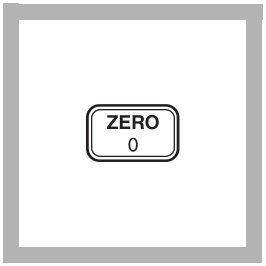


6. 다른 샘플셀에 샘플 10mL을 채운다. (the blank)
셀 표면을 깨끗이 닦아 준다.

Note: *Wiping with a damp towel, followed by a dry one, removes fingerprints and other marks.*



7. blank를 셀 홀더에 넣고 기기 덮개를 덮는다.



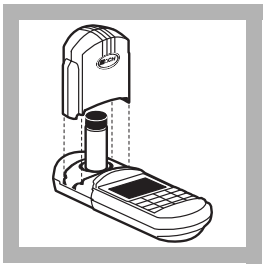
8. ZERO키를 누른다.

화면에 다음과 같이 표시된다:

0 mg/L NO2

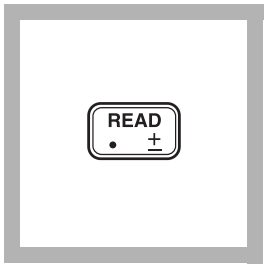
Note: *If Reagent Blank Correction is on, the display may flash "limit". See Section 1.*

* Adapted from McAlpine, R. and Soule, B., *Qualitative Chemical Analysis*, New York, 476,575 (1933)



9. 타이머가 울린 후 측정할 샘플셀을 가볍게 두번정도 흔들어 주고, 셀 홀더에 넣은 후 기기 덮개를 덮는다.

Note: *Avoid excessive mixing or low results may occur.*



10. **READ**키를 누른다.

화면에 결과치가 mg/L nitrite으로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Standard Adjust in Section 1).*

REQUIRED REAGENTS AND APPARATUS

Description	Quantity Required Per Test	Unit	Cat. No.
NitriVer 2 Nitrite Reagent Powder Pillows	1 pillow	100/pkg	21075-69
Sample cell, 10-20-25, w/ cap	2	6/pkg	24019-06

OPTIONAL REAGENTS

Nitrite Standard Solution, 821 mg/L NO_2 (250 mg/L NO_2^--N)		500 mL	23402-49
Sodium Nitrite, ACS		454 g	2452-01
Water, deionized		4 L	272-56

OPTIONAL APPARATUS

Balance, analytical, 110 V, Acculab UI Series, 120 g		each	26947-00
Flask, volumetric, 1000 mL		each	14547-53
Flask, volumetric, 100 mL, Class A		each	14574-42
Pipet, volumetric, 10.00 mL, Class A		each	14515-38
Pipet Filler, safety bulb		each	14651-00

For Technical Assistance, Price and Ordering

In the U.S.A.—Call 800-227-4224

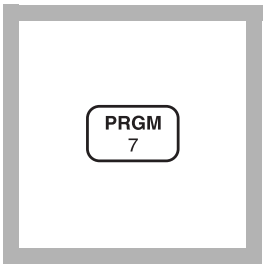
Outside the U.S.A.—Contact the Hach office or distributor serving you.

NITRITE, Low Range (0 to 0.350 mg/L NO_2^--N)

For water, wastewater, seawater

Diazotization Method* (Powder Pillows or AccuVac Ampuls);

USEPA approved for reporting wastewater and drinking water analyses.



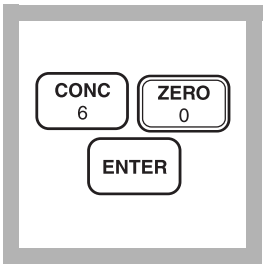
1. 다음 항목 실험을 위해 번호를 선택한다. nitrite nitrogen (NO_2^--N), powder pillows.

Press: **PRGM**

The display will show:

PRGM ?

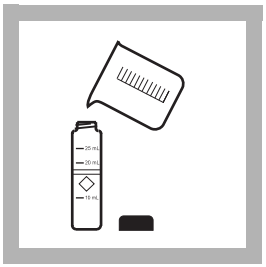
Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*



2. 60번을 선택하고

ENTER. 화면에 **mg/L, NO2-N**와 **ZERO** 아이콘이 표시.

Note: *For alternate forms (NO_2^-, $NaNO_2$), press the* **CONC** *key.*

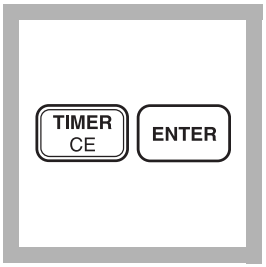


3. 샘플셀에 샘플을 10mL 채운다.

4. NitriVer 3 Nitrite Reagent Powder Pillow 를 하나 샘플셀에 첨가한다. 뚜껑을 닫고 흔들어서 파우더를 용해시킨다.

Note: *Accuracy is not affected by undissolved powder.*

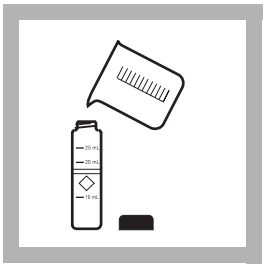
* *Federal Register*, 44(85) 25505 (May 1, 1979)



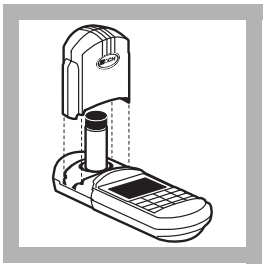
5. 다음 버튼을 누른다:
TIMER ENTER

15분간의 반응시간을 표시한다.

Note: *A pink color will develop if nitrite is present.*

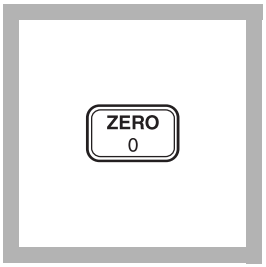


6. 타이머가 울린 후 다른 샘플셀에 샘플을 10mL 채운다.
(the blank)



7. blank의 표면을 깨끗이 닦아서 셀 홀더에 넣고 기기 덮개를 덮어준다.

Note: *Wiping with a damp cloth, followed by a dry pne, removes fingerprints and other marks.*

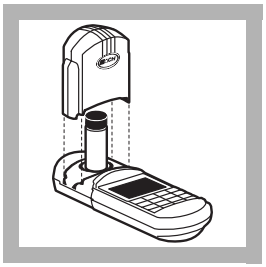


8. **ZERO**키를 누른다.

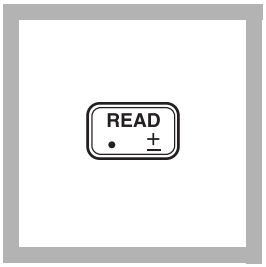
화면에 다음과 같이 나타난다:

0.000 mg/L NO2-N

Note: *If Reagent Blank Correction is on, the display may flash "limit." See Section 1.*



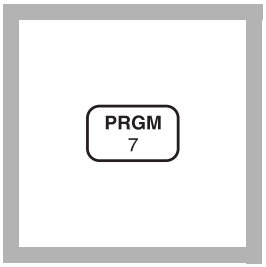
9. 측정할 샘플셀을 셀 홀더에 넣고 기기 덮개를 덮는다.



10. **READ**키를 누른다.

화면에 결과치가 mg/L nitrite nitrogen (또는 선택한 단위)로 표시된다.

Using AccuVac Ampuls



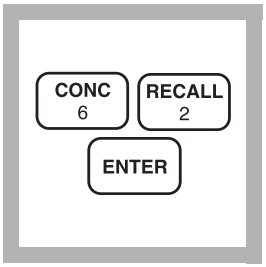
1. 다음 항목의 실험을 위해 번호를 선택한다. nitrite nitrogen (NO_2^--N), AccuVac Ampuls.

Press: **PRGM**

The display will show:

PRGM ?

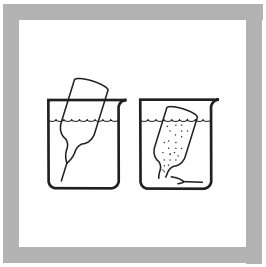
Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*



2. 62번을 선택하고

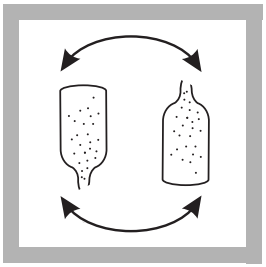
ENTER. 화면에 **mg/L, NO2-N**와 **ZERO** 아이콘이 표시.

Note: *For alternate forms (NO_2^-, $NaNO_2$), press the* **CONC** *key.*



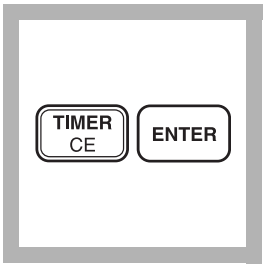
3. 비커에 샘플을 40mL 이상 채운다. NitriVer 3 Nitrite AccuVac Ampul에 준비한 샘플을 채운다.

Note: *Keep the tip immersed while the ampul fills completely.*



4. 엠퓰을 빠르게 여러번 뒤집어서 섞어준다. 엠퓰 표면을 깨끗이 닦아준다.

Note: *Accuracy is not affected by undissolved powder.*

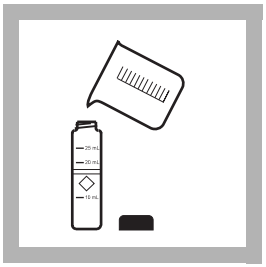


5. 다음 버튼을 누른다:

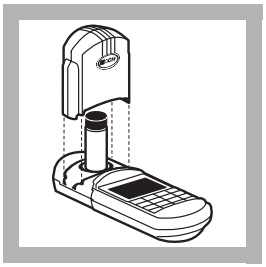
TIMER ENTER

15분간의 반응 시간을 나타낸다.

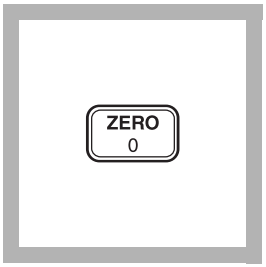
Note: *A pink color will develop if nitrite is present.*



6. 타이머가 울린 후 샘플셀에 샘플을 10mL 이상 채운다. (the blank)



7. blank를 셀 홀더에 넣고 기기 덮개를 덮는다.

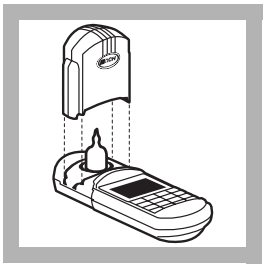


8. ZERO키를 누른다.

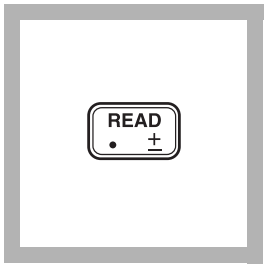
화면에 다음과 같이 나타난다:

0.000 mg/L NO2-N

Note: *If Reagent Blank Correction is on, the display may flash "limit." See Section 1.*



9. AccuVac Ampul을 셀 홀더에 넣고 기기 덮개를 덮는다.



10. **READ**키를 누른다.

화면에 결과치가 mg/L nitrite nitrogen 으로 나타난다.

REQUIRED REAGENTS

Description	Quantity Required Per Test	Unit	Cat. No.
NitriVer 3 Nitrite Reagent Powder Pillows	1 pillow	100/pkg	21071-69
or			
NitriVer 3 Nitrite Reagent AccuVac Ampuls	1 ampul	25/pkg	25120-25

REQUIRED APPARATUS

Beaker, 50 mL (for AccuVac procedure)	1	each	500-41H
or			
Sample Cells, 10-20-25 mL (powder pillow procedure)	2	6/pkg	24019-06

OPTIONAL REAGENTS

Nitrite Standard Solution, 250 mg/L as NO_2^--N	500	mL	23402-49
Water, deionized	4	L	272-56

OPTIONAL APPARATUS

Description	Unit	Cat. No.
AccuVac Snapper Kit	each	24052-00
Flask, volumetric, 250 mL	each	14574-46
Flask, volumetric, 500 mL	each	14574-49
Pipet, serological, 10 mL	each	532-38
Pipet, TenSette, 1 to 10 mL	each	19700-01
Pipet Tips for 19700-01 TenSette Pipet	50/pkg	21856-96
Pipet Tips, for 19700-01 TenSette Pipet	1000/pkg	21856-28
Pipet, volumetric, Class A, 5.00 mL	each	14515-37
Pipet, volumetric, Class A, 10.00 mL	each	14515-38
Pipet Filler, safety bulb	each	14651-00
Thermometer, –20 to 110 °C	each	26357-02

For Technical Assistance, Price and Ordering

In the U.S.A. call 800-227-4224

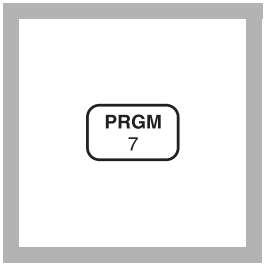
Outside the U.S.A.—Contact the Hach office or distributor serving you.

NITRITE, Low Range, Test ‘N Tube (0–0.500 mg/L NO_2^--N)

Diazotization Method

For water, wastewater, and seawater

USEPA approved for wastewater analysis*



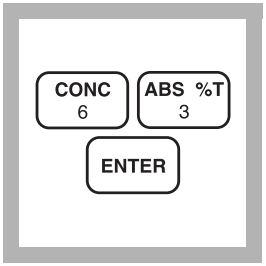
1. 다음 항목의 측정을 위해 번호를 선택한다. nitrite nitrogen (NO_2^--N), Test ‘N Tube.

Press: **PRGM**

The display will show:

PRGM ?

Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*



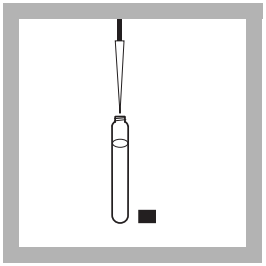
2. 63번을 선택하고

ENTER. 화면에 **mg/L, NO2-N**와 **ZERO** 아이콘이 표시.

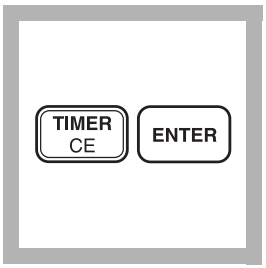
Note: *For alternate forms (NO_2^-, $NaNO_2$), press the* **CONC** *key.*

3. COD/TNT 아답타를 기기 셀 홀더에 맞춰 끼운다.

Note: *For increased performance, a diffuser band covers the light path holes on the adapter. Do not remove the diffuser band.*



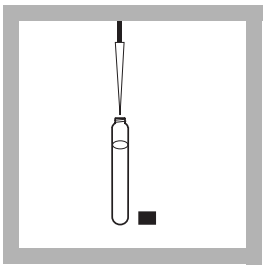
4. Test ‘N Tube NitriVer® 3 Nitrite vial에 샘플을 5mL 채운다. 뚜껑을 닫고 흔들어서 파우더를 용해시킨다. (the prepared sample)



5. 다음 버튼을 누른다:
TIMER ENTER

20분간의 반응 시간이 표시된다.

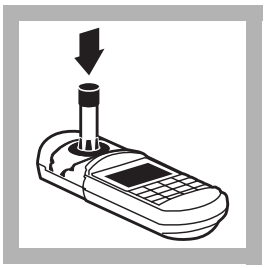
Note: *A pink color will develop if nitrite is present.*



6. 타이머가 울린 후 비어 있는 다른 Test ‘N Tube vial에 샘플을 5mL 채운다. (the blank)

7. 바이알들의 표면을 깨끗이 닦아준다.

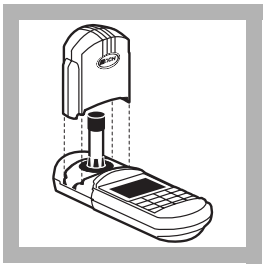
Note: *Wipe with a damp towel and follow with a dry one to remove fingerprints and other marks.*



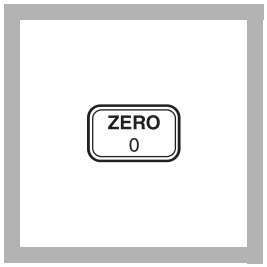
8. blank를 바이알 아답타에 맞춰서 끼운다.

Note: *Do not move the vial from side to side as this can cause errors.*

* *Federal Register,* 44(85) 25505 (May 1, 1979).



9. 기기 덮개를 덮는다.

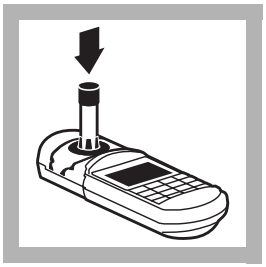


10. **ZERO**키를 누른다.

화면에 다음과 같이 나타난다:

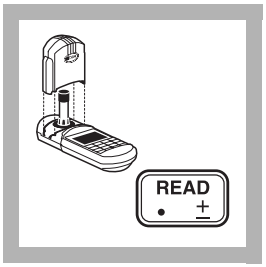
0.000 mg/L NO2-N

Note: *If the reagent blank correction is on, the display may flash "limit." See Section 1.*



11. 측정할 샘플이 담긴 바이알을 아답타에 맞춰 끼운다.

Note: *Do not move the vial from side to side as this can cause errors.*



12. 기기 덮개를 덮는다.

READ키를 누른다.

화면에 결과치가 mg/L nitrite nitrogen (또는 선택한 단위)로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Section 1).*

REQUIRED REAGENTS

Description	Cat. No.
NitriVer® 3 Nitrite, Low Range Test 'N Tube Reagent Set (50 tests)	26083-45
Includes:	
(50) NitriVer® 3 Nitrite Test 'N Tube Vials	*
Vials, 6 x 100 mm, 6/pkg	22758-06
Caps, for 22758-06 vials, 6/pkg	22411-06
Deionized water, 100-mL	272-42

REQUIRED APPARATUS

Description	Quantity Required Per Test	Unit	Cat. No.
COD/TNT Adapter	1	each	48464-00
Test Tube Rack	1-3	each	18641-00
Pipet, TenSette, 1 to 10 mL	1	each	19700-10
Pipet Tips for 19700-10 TenSette Pipet	1	50/pkg	21997-96

OPTIONAL REAGENTS

Nitrite Standard Solution, 250 mg/L as NO_2^--N	500	mL	23402-49
Water, deionized	4	L	272-56

OPTIONAL APPARATUS

Flask, volumetric, 250 mL	each	14574-46
Flask, volumetric, 500 mL	each	14574-49
Pipet, volumetric, Class A, 10.00 mL	each	14515-38

For Technical Assistance, Price and Ordering

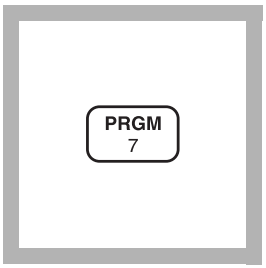
In the U.S.A. call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

* Not available separately.

NITROGEN, AMMONIA (0 to 0.50 mg/L NH_3-N) For water, wastewater, seawater

Salicylate Method*

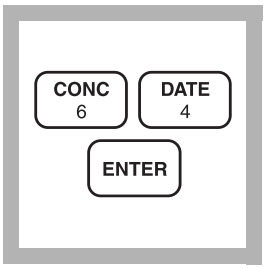


1. 다음 항목 측정을 위해 번호를 선택한다. ammonia nitrogen (NH_3-N).

Press: **PRGM**

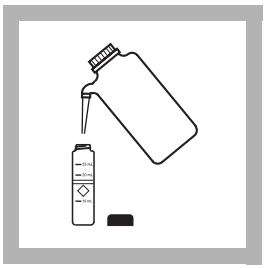
The display will show:

PRGM ?

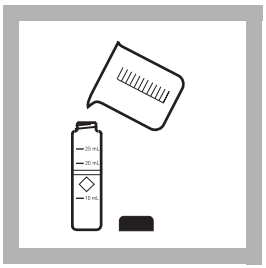


2. **64**번을 선택하고 **ENTER.** 화면에 **mg/L, NH3-N**와 **ZERO** 아이콘이 표시.

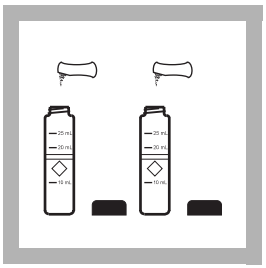
Note: *For alternate forms (NH_3, NH_4), press the* **CONC** *key.*



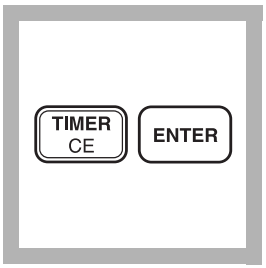
3. 샘플셀에 증류수를 10mL 채운다. (the blank)



4. 두번째 샘플셀에 샘플을 10mL 채운다.



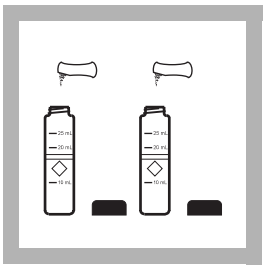
5. Ammonia Salicylate Reagent Powder Pillow 를 하나씩 각 셀에 첨가한다. 뚜껑을 닫고 흔들어서 파우더를 용해시킨다.



6. 다음 버튼을 누른다:

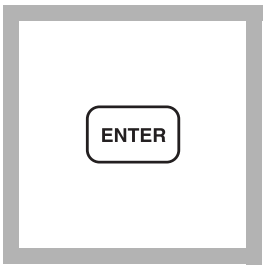
TIMER ENTER

3분간의 반응시간이 표시된다.



7. 타이머가 울린 후 Ammonia Cyanurate Reagent Powder Pillow 를 하나씩 각 셀에 첨가하고 흔들어서 용해시킨다.

Note: *A green color will develop if ammonia nitrogen is present.*

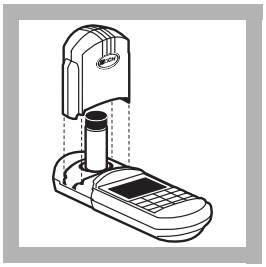


8. 화면에 다음처럼 나타난다: **15:00 TIMER 2**

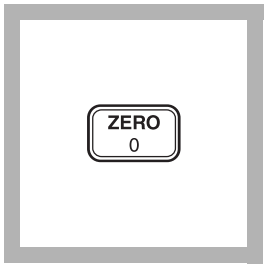
ENTER키를 누른다.

15분간의 반응시간이 표시된다.

* Adapted from Clin. Chim. Acta., 14 403 (1966)



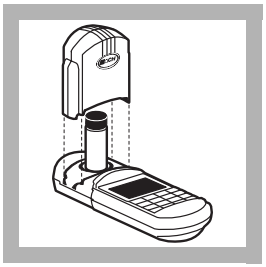
9. 타이머가 울린 후 blank를 셀 홀더에 넣고 기기덮개를 덮는다.



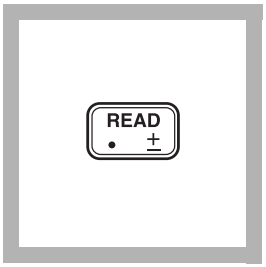
10. **ZERO**키를 누른다.

화면에 다음과 같이 나타난다:

0.00 mg/L NH3-N



11. 측정할 샘플 셀을 셀 홀더에 넣고 기기 덮개를 덮는다.



12. **READ**키를 누른다.

화면에 결과치가 mg/L ammonia nitrogen 으로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Standard Adjust in Section 1).*

REQUIRED REAGENTS AND APPARATUS

	Cat. No.
Ammonia Nitrogen Reagent Set for 10-mL samples (100 tests)	26680-00
Includes: (2) 26531-99, (2) 26532-99	

Description	Quantity Required Per Test	Unit	Cat. No.
Ammonia Cyanurate Reagent Powder Pillows	2 pillows	100/pkg	26531-99
Ammonia Salicylate Reagent Powder Pillows	2 pillows	100/pkg	26532-99
Sample Cell, 10-20-25 mL, w/ cap	2	6/pkg	24019-06

OPTIONAL REAGENTS

Ammonia Nitrogen Standard Solution, 10 mg/L as NH_3-N	500 mL	153-49
Ammonia Nitrogen, PourRite Ampules, 50 mg/L as NH_3-N, 2 mL	20/pkg	14791-20
Cylinder, graduated, mixing, 25 mL	each	20886-40
Sodium Hydroxide Standard Solution, 1.0 N	100 mL MDB	1045-32
Sodium Hydroxide Standard Solution, 5.0 N	50 mL SCDB	2450-26
Sodium Thiosulfate Standard Solution, 0.1 N	100 mL MDB	323-32
Sulfide Inhibitor Reagent Powder Pillows	100/pkg	2418-99
Sulfuric Acid, concentrated, ACS	500 mL	979-49
Sulfuric Acid Standard Solution, 1.0 N	100 mL MDB	1270-32
Water, deionized	4 L	272-56

OPTIONAL APPARATUS

Cylinder, graduated, polypropylene, 500 mL	each	1081-49
Distillation Heater and Support Apparatus, 115 V	each	22744-00
Distillation Heater and Support Apparatus, 230 V	each	22744-02
Distillation Set, General Purpose	each	22653-00
Filter Paper, folded, 12.5 cm	100	1894-57
Flask, Erlenmeyer, polypropylene, 500 mL	each	1082-49
Flask, volumetric, Class A, 100 mL	each	14574-42
Funnel, poly, 65 mm	each	1083-67
pH Meter, *sension*™*1*, portable, with electrode	each	51700-10
Pipet Filler, safety bulb	each	14651-00
Pipet, TenSette, 0.1 to 1.0 mL	each	19700-01
Pipet Tips, for 19700-01 TenSette Pipet	50/pkg	21856-96
Pipet Tips, for 19700-01 TenSette Pipet	1000/pkg	21856-28
Pipet, volumetric, Class A, 2.0 mL	each	14515-36
PourRite Ampule Breaker Kit	each	24846-00
Thermometer, –20 to 110 °C	each	26357-02

For Technical Assistance, Price and Ordering

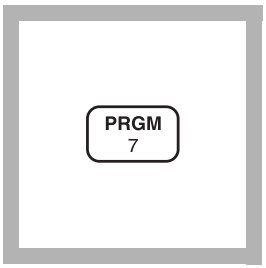
In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

NITROGEN, AMMONIA, Low Range, Test 'N Tube (0 to 2.50 mg/L NH_3-N)

Salicylate Method*

For water, wastewater, and seawater

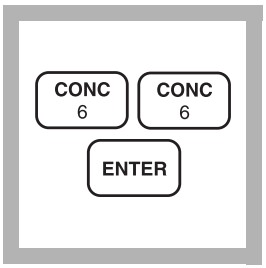


1. low range nitrogen, ammonia Test'N Tube 의 측정을 위해 번호를 선택한다.

Press: **PRGM**

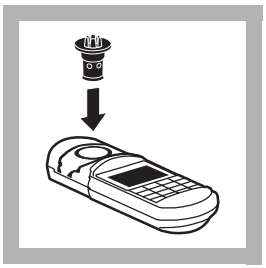
The display will show:

PRGM ?



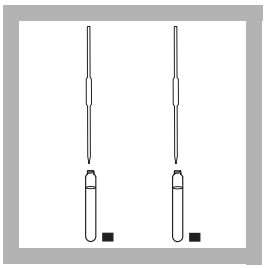
2. 66번을 선택하고 **ENTER.** 화면에 **mg/L, NH3-N**와 **ZERO** 아이콘이 표시**.**

Note: *For alternate forms (NH_3), press the* **CONC** *key.*



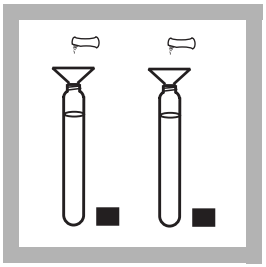
3. COD/TNT 아답타를 기기 셀 홀더에 맞춰 끼운다.

Note: *For increased performance, a diffuser band covers the light path holes on the adapter. Do not remove the diffuser band.*

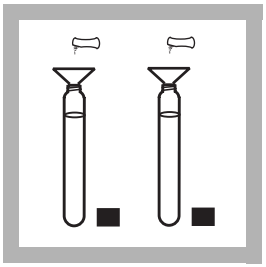


4. AmVer Diluent Reagent vial 두개의 뚜껑을 열고 한 바이알에 샘플을 2mL 채우고 (the sample) 다른 한 바이알엔 증류수를 2mL 채운다. (the blank)

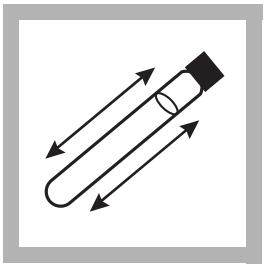
Note: *Adjust the pH of stored samples before analysis. See Interferences on page 247.*



5. Ammonia Salicylate Reagent Powder Pillow 를 각 샘플셀에 첨가한다.

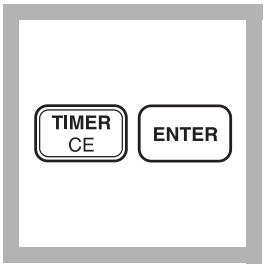


6. Ammonia Cyanurate Reagent Powder Pillow 를 각 샘플셀에 첨가한다.



7. 바이알들의 뚜껑을 닫고 파우더가 용해 될 때가지 흔들어 준다.

Note: *A green color will develop if ammonia is present.*



8. 다음 버튼을 누른다:

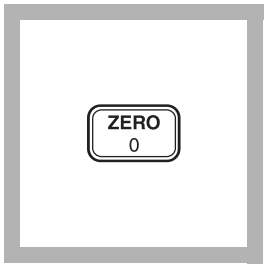
TIMER ENTER

20분간의 반응시간이 표시된다.

* Adapted from *Clin. Chim. Acta*, 14 403 (1966).

9. 바이알의 표면을 깨끗이 닦아준다. 타이머가 울린 후, blank를 아답타에 끼우고 기기 덮개를 덮는다.

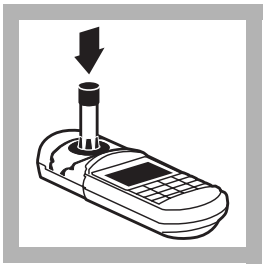
Note: *Wipe with a damp cloth followed by a dry one to remove fingerprints and other marks.*



10. **ZERO**키를 누른다.

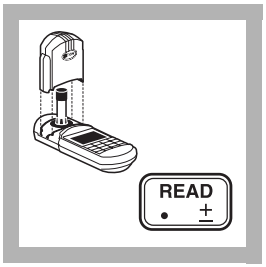
화면에 다음과 같이 나타난다:

0.00 mg/L NH3-N



11. 측정할 바이알을 아답타에 맞춰 끼운다.

Note: *Do not move the vial from side to side as this can cause errors.*



12. 기기 덮개를 덮는다.

READ키를 누른다.

화면에 결과치가 mg/L ammonia nitrogen 으로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Standard Adjust (Adjusting the Standard Curve) on page 47).*

REQUIRED REAGENTS

	Cat. No.
AmVer Reagent Set for Nitrogen, Ammonia, Low Range TNT (25 tests)	26045-45
Includes: (1) 23952-66, (1) 23954-66, (1) 272-42, *(50) AmVer Low Range Vials	

Description	Quantity Required Per Test	Unit	Cat. No.
AmVer Diluent Reagent, Low Range Test 'N Tube	2 vials	50/pkg	*
Salicylate Reagent Powder Pillows, 5 mL sample	2 pillows	50/pkg	23952-66
Cyanurate Reagent Powder Pillows, 5 mL sample	2 pillows	50/pkg	23954-66

REQUIRED APPARATUS

Vial Adapter, COD	1	each	48464-00
Test Tube Rack	1-3	each	18641-00
Pipet, TenSette, 0-10 mL	1	each	19700-10
Pipet Tips for 19700-10	2	50/pkg	21997-96
Funnel, micro (for reagent addition)	1	each	25843-35

OPTIONAL REAGENTS

Nitrogen, Ammonia Standard Solution, 1.0 mg/L NH_3-N	500 mL	1891-49
Nitrogen, Ammonia Standard Solution, 10 mL Voluette ampules, 50 mg/L NH_3-N	16/pkg	14791-10
Nitrogen, Ammonia Standard Solution, 2 mL PourRite ampules, 50 mg/L NH_3-N	20/pkg	14791-20
Hydrochloric Acid, ACS	500 mL	134-49
Sodium Hydroxide Standard Solution, 5.0 N	50 mL SCDB	2450-26
Sodium Hydroxide, 1.000 N	100 mL MDB	1045-32
Sodium Thiosulfate Standard Solution, 0.1 N	100 mL MDB	323-32
Sulfide Inhibitor Reagent Powder Pillows	100/pkg	2418-99
Sulfuric Acid, 1.00 N	100 mL MDB	1270-32
Wastewater Effluent Standard, Inorganics (NH_3–N, NO_3–N, PO_4, COD, SO_4, TOC)	500 mL	28332-49
Water, deionized	4 L	272-56

* Not available separately.

OPTIONAL APPARATUS

Ampule Breaker Kit	each	21968-00
Cylinder, graduated, mixing, 25 mL, Class A	each	508-40
Distillation Apparatus Set	each	22653-00
Heater and Support Apparatus (for distillation), 115 Vac	each	22744-00
Heater and Support Apparatus (for distillation), 230 Vac	each	22744-02
Filter Paper, folded	100/box	1894-57
Flask, Erlenmeyer, 500 mL	each	505-49
Flask, volumetric, 50 mL, Class A	each	14547-41
Funnel, analytical (for filtering)	each	1083-68
Jack, laboratory (use with distillation apparatus)	each	22743-00
pH Indicator Paper, 1 to 11 pH	5 rolls/pkg	391-33
Ampule Breaker Kit, PourRite	each	24846-00
Thermometer, –20 to 110 °C, non-mercury	each	26357-02
Thermometer, –10 to 260 °C, non-mercury	each	26357-01

For Technical Assistance, Price and Ordering

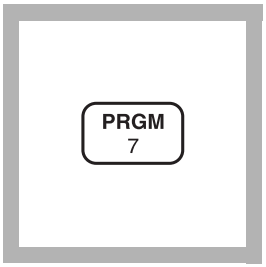
In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

Indophenol Method*

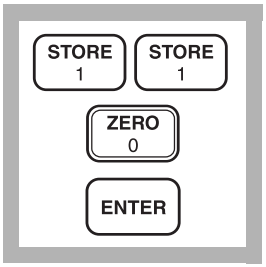
(0–4.50 mg/L Cl_2 and 0–0.50 mg/L NH_3–N)
For finished chloraminated drinking water

Note: *For the most accurate chloramine results, determine a reagent blank for each new lot of reagent using deionized water instead of sample. Subtract the blank value from the final chloramine result.*



1. monochloramine 측정을 위해 번호를 선택한다.

Press: **PRGM**
The display will show:
PRGM?



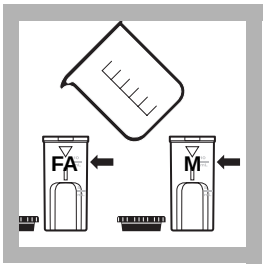
2. **110**번을 선택하고 **ENTER**입력

화면에 다음처럼 표시:

mg/L Cl_2

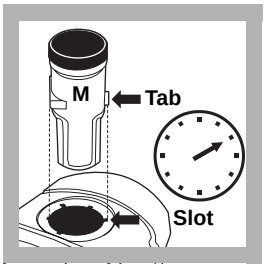
그리고 zero 아이콘표시.

Note: *For alternate forms, press the* **CONC** *key.*

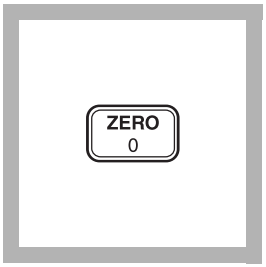


3. 두 샘플셀에 샘플을 10mL씩 채운다.

각 한 셀씩 “Free Ammonia”와 "Monochloramine”을 표시한다.



4. Monochloramine셀을 셀 탭이 2시 방향을 향하게 해서 셀 홀더에 맞춰 끼운다.
기기 덮개를 덮는다.

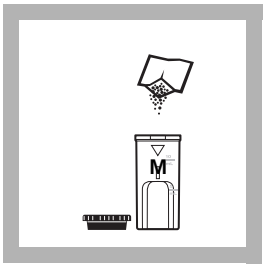


5. **ZERO**키를 누른다.

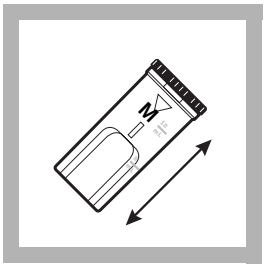
화면에 다음과 같이 표시된다:

0.00 mg/L Cl_2

셀을 기기에서 꺼낸다.

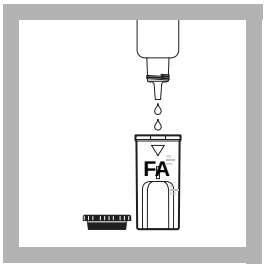


6. Monochlor F pillow를 하나 셀에 첨가해서 Monochloramine측정을 준비한다.



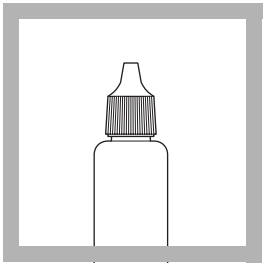
7. 셀 뚜껑을 닫고 20초 가량 흔들어서 시약을 용해시킨다.

monochloramine이 존재 한다면 녹색이 나타난다.

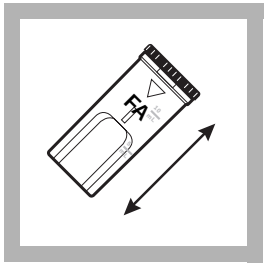


8. Free Ammonia셀에 Free Ammonia Reagent Solution을 한방을 첨가해서 Free Ammonia 측정을 준비한다.

* U.S. Patent 6,315,950

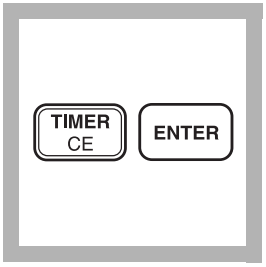


9. 시약병의 뚜껑을 닫아서 보관한다.



10. 셀 뚜껑을 닫고 흔들어서 섞어준다.

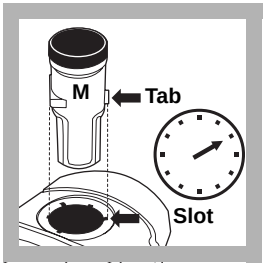
Note: *If the sample becomes cloudy by the end of the reaction period, pretreat the sample and retest. See Interferences on page 254.*



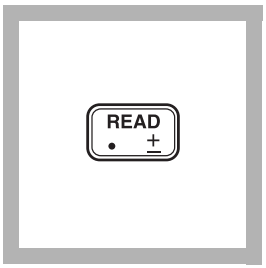
11. 다음 버튼을 누른다: **TIMER ENTER**

5분간의 반응 시간이 표시된다.

Note: *The color development time depends on the sample temperature. See Table 1. For accurate results allow the full reaction period to occur.*



12. 타이머가 종료되면 Monochloramine 셀을 셀 탭이 2시방향을 향하게 해서 셀 홀더에 맞춰 끼운다. 기기 덮개를 덮는다.



13. **READ**키를 누른다.

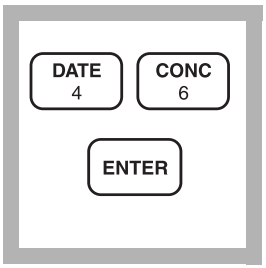
화면에 결과치가 mg/L Monochloramine (Cl_2 또는 선택한 단위)로 표시된다.

셀을 기기에 그대로 둔다.

14. stored program에서 Free Ammonia 항목을 찾는다.

Press: **PRGM**

The display will show PRGM?



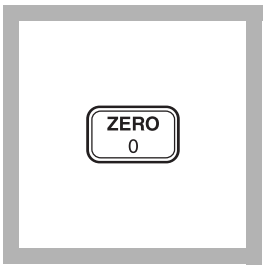
15. **46**번을 선택하고 **ENTER** 입력

화면에 다음처럼 표시:

NH_3–N

그리고 ZERO아이콘표시.

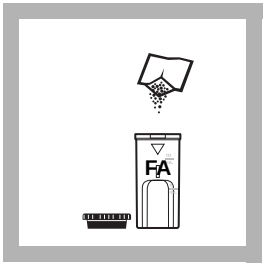
Note: *For alternate forms, press the* **CONC** *key.*



16. Monochloramine 셀을 셀 홀더에 그대로 둔 상태에서, **ZERO**키를 누른다.

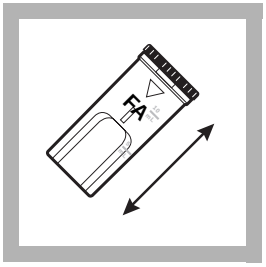
화면에 다음처럼 나타난다:
0.00 mg/L NH_3–N.

셀을 기기에서 꺼낸다.



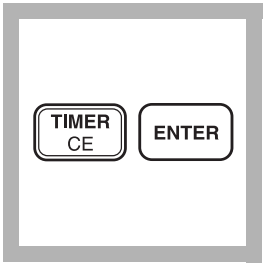
17. Monochlor F pillow 하나를 Free Ammonia셀에 첨가해서 측정을 준비한다.

Note: *The reaction period indicated in step 11 must be complete before the addition of Monochlor F to the cell for free ammonia measurement.*



18. 셀 뚜껑을 닫고 약 20여초간 흔들어서 시약을 용해 시킨다.

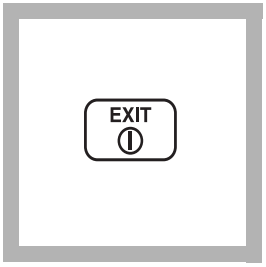
ammonia 또는 monochloramine이 존재 한다면 녹색이 나타난다.



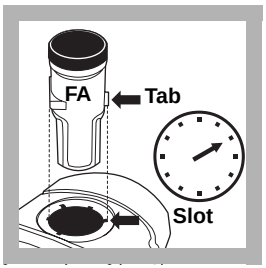
19. 다음 버튼을 누른다:**TIMER ENTER**

5분간의 반응시간이 나타난다.

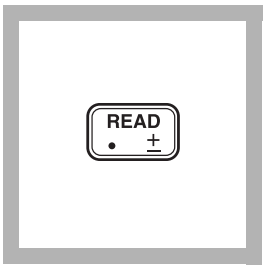
Note: *The color development time depends on the sample temperature. See Table 1.*



20. 타이머가 끝난 뒤, **EXIT**키를 누른다.



21. Free Ammonia 셀을 셀 탭이 2시방향을 향하게 해서 셀 홀더에 끼운다.
기기 덮개를 덮는다.



22. **READ**키를 누른다.

화면에 결과치가 mg/L free ammonia as nitrogen(NH_3–N) 또는 선택한 단위로 표시.

REQUIRED REAGENTS

Description	Quantity Required Per Test	Unit	Cat. No.
Free Ammonia Reagent Set (50 tests)			
Includes: (1) 28022-99, (1) 28773-36			28797-00
Free Ammonia Reagent Solution	1 drop	4 mL SCDB	28773-36
Monochlor F Reagent Pillows	2 pillows	100/pkg	28022-99

REQUIRED APPARATUS

Sample Cell, 1-cm/10-mL, with cap	2	2/pkg	48643-02

OPTIONAL REAGENTS

Buffer, pH 8.3, Powder Pillows	25/pkg	898-68
Chlorine Solution, Voluette® Ampule	16/pkg	14268-10
Hardness Treatment Reagent Pillows (1 per test)	50/pkg	28823-46
Nitrogen Ammonia Standard Solution, 10 mg/L as NH_3–N	500 mL	153-49
Nitrogen Ammonia Standard Ampule, 50 mg/L as NH_3–N, 10 mL	16/pkg	14791-10
Nitrogen Ammonia Standard Solution, 100 mg/L as NH_3–N	500 mL	24065-10

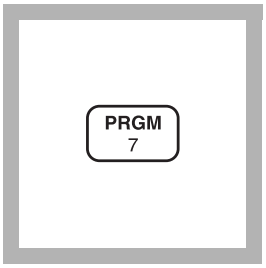
OPTIONAL APPARATUS

Description	Per Test	Unit	Cat. No.
Ampule Breaker Kit		each	21968-00
Beaker, 100 mL, Polypropylene		each	1080-42
Beaker, 100 mL, Glass		each	500-42H
Cylinder, 50 mL, mixing		each	20886-41
Flask, Volumetric, Class A, 100 mL		each	14574-42
Pipet Filler, Safety Bulb		each	14651-00
Pipet, TenSette®, 0.1 to 1.0 mL		each	19700-01
Pipet Tips, for 19700-01 TenSette Pipet		50/pkg	21856-96
Pipet, Mohr, Glass, 10 mL		each	20934-38
Pipet, Volumetric, Class A, 2.0 mL		each	14515-36
Pipet, Volumetric, Class A, 50.00 mL		each	14515-41
Scissors		each	28831-00
Stir Bar, Octagonal		each	20953-53
Stirrer, Magnetic		each	23436-00
Thermometer, –10 to 110 °C		each	1877-01
Wipers, Disposable Kimwipes®, 30 x 30 cm, 280/box		box	20970-01

NITROGEN, AMMONIA, High Range, Test ‘N Tube

(0 to 50 mg/L NH_3-N) **For water, wastewater, and seawater**

Salicylate Method*

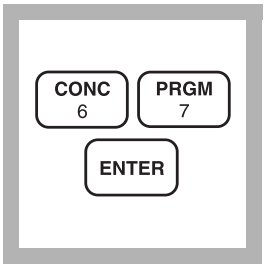


1. 다음 항목 측정을 위해 번호를 선택한다: nitrogen, ammonia, high range Test ‘N Tube (NH_3-N) method.

Press: **PRGM**

The display will show:

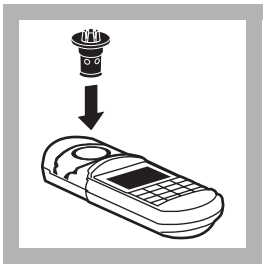
PRGM ?



2. 67번을 선택하고 **ENTER.** 화면에 **mg/L, NH3-N**과 **ZERO** 아이콘이 표시**.**

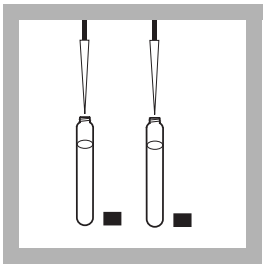
Note: *For alternate forms (NH_3), press the* **CONC** *key.*

Note: *For proof of accuracy, use a 10-mg/L nitrogen, ammonia standard in place of the sample.*

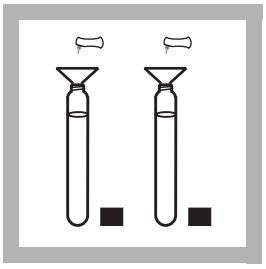


3. COD/TNT 아답타를 셀 홀더에 맞춰 끼운다.

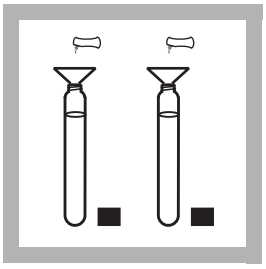
Note: *For increased performance, a diffuser band covers the light path holes on the adapter. Do not remove the diffuser band.*



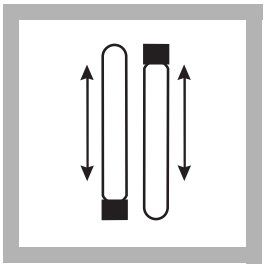
4. AmVer Diluent Reagent High Range Vial 두개의 뚜껑을 연다. 한 바이알엔 샘플 0.1mL을 채우고(the sample), 다른 바이알엔 증류수를 0.1mL 채운다. (the blank)



5. 1 Ammonia Salicylate Reagent Powder Pillow를 각 바이알에 첨가한다.

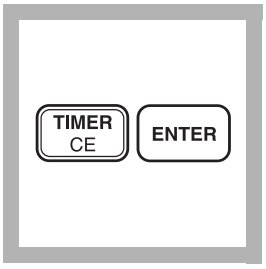


6. 1 Ammonia Cyanurate Reagent Powder Pillow를 각 바이알에 첨가한다.



7. 바이알 뚜껑을 닫고 흔들어서 파우더를 용해시킨다.

Note: *A green color will develop if ammonia is present.*



8. 다음 버튼을 누른다:

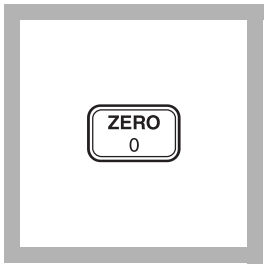
TIMER ENTER

20분간의 반응시간이 표시된다.

* Adapted from *Clin. Chim. Acta*, **14** 403 (1966).

9. 바이알의 표면을 깨끗이 닦아준다. 타이머가 울린 후, blank를 바이알 아답타에 끼우고 기기 덮개를 덮는다.

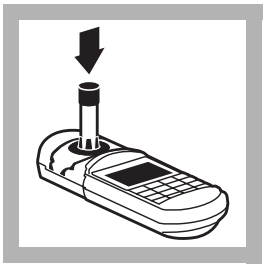
Note: *Wipe with a damp cloth and follow with a dry one to remove fingerprints and other marks.*



10. ZERO키를 누른다.

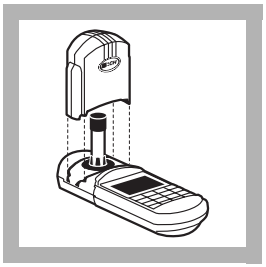
화면에 다음처럼 표시된다:

0 mg/L NH3-N

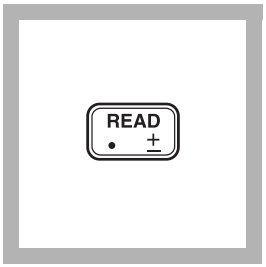


11. 측정할 샘플을 아답타에 맞춰 끼운다.

Note: *Do not move the vial from side to side as this can cause errors.*



12. 기기 덮개를 덮는다.



13. READ키를 누른다.

화면에 결과치가 mg/L NH_3-N으로 표시된다.

Note: *Standard Adjust may be performed using a prepared standard (see Standard Adjust in Section 1).*

REQUIRED REAGENTS

AmVer™ Reagent Set for Nitrogen, Ammonia, High Range, TNT (25 tests) 26069-45
Includes: (1) 23952-66, (1) 23954-66, (1) 272-42, *(50) AmVer HR Vials

Description	Quantity Required Per Test	Unit	Cat. No.
AmVer™ HR Reagent Test 'N Tube™ Vials	2 vials	50/pkg	*
Ammonia Salicylate Reagent Powder Pillows	2 pillows	50/pkg	23952-66
Ammonia Cyanurate Reagent Powder Pillows	2 pillows	50/pkg	23954-66

REQUIRED APPARATUS

COD/TNT Adapter	1	each	48464-00
Pipet, TenSette®, 0-1 mL	1	each	19700-01
Pipet Tips for 19700-01	varies	50/pkg	21856-96
Test Tube Rack	1-3	each	18641-00
Funnel, micro (for reagent addition)	1	each	25843-35

OPTIONAL REAGENTS

Description	Quantity Required Per Test	Unit	Cat. No.
Nitrogen, Ammonia Standard Solution, 50 mg/L NH_3-N		500 mL	14791-50
Nitrogen, Ammonia Standard Solution, 10 mg/L NH_3-N		500 mL	153-49
Ammonia Standard Solution, PourRite™ ampules, 150 mg/L NH_3-N, 2 mL		20/pkg	21284-20
Hydrochloric Acid, ACS		500 mL	134-49
Sodium Hydroxide Standard Solution, 5.0 N		50 mL	2450-26
Sodium Hydroxide Standard Solution, 1.0 N		100 mL	1045-32
Sodium Thiosulfate Standard Solution, 0.1 N		100 mL	323-32
Sulfide Inhibitor Powder Pillows		100/pkg	2418-99
Sulfuric Acid, 1.00 N		100 mL MDB	1270-32
Wastewater Influent Standard, Inorganic (NH_3–N, NO_3, PO_4, COD, SO_4, TOC)		500 mL	28331-49
Water, deionized		4 L	272-56

* Not available separately.

OPTIONAL APPARATUS

Cylinder, 25 mL, graduated, mixing	each	20886-40
Distillation Apparatus Set, general purpose	each	22653-00
Heater and Support Apparatus (for distillation), 115 VAC	each	22744-00
Heater and Support Apparatus (for distillation), 230 VAC	each	22744-02
Filter Paper, folded	100/pkg	1894-57
Flask, Erlenmeyer, 500 mL	each	505-49
Funnel, analytical (for filtering)	each	1083-68
Jack, laboratory (use with distillation apparatus)	each	22743-00
pH Indicator Paper, 1 to 11 pH	5 rolls/pkg	391-33
Pipet Tips, for 19700-01 TenSette Pipet	1000/pkg	21856-28
PourRite™ Ampule Breaker	each	24846-00
Sample Cell, 10-20-25 mL, w/cap	6/pkg	24019-06

For Technical Assistance, Price and Ordering

In the U.S.A.—Call 800-227-4224

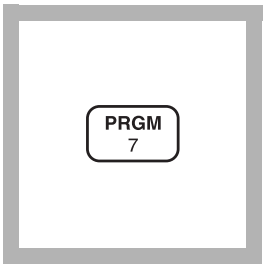
Outside the U.S.A.—Contact the Hach office or distributor serving you.

NITROGEN, Total Inorganic, Test ‘N Tube™ (0 to 25.0 mg/L N)

Titanium Trichloride Reduction Method

For water, wastewater, and seawater

Requires Centrifuge

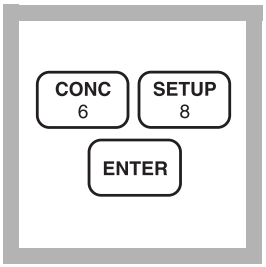


1. Test'N Tube Total Inorganic Nitrogen 측정을 위해 번호를 선택한다.

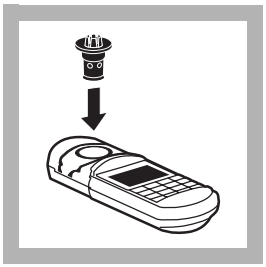
Press: **PRGM**

The display will show:

PRGM ?

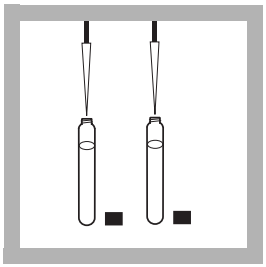


2. 68번을 선택하고 **ENTER.** 화면에 **mg/L, N**과 **ZERO** 아이콘이 표시.

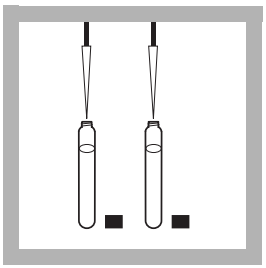


3. COD/TNT 아답타를 셀 홀더에 맞춰 끼운다.

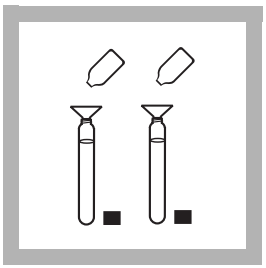
Note: *For increased performance, a diffuser band covers the light path holes on the adapter. Do not remove the diffuser band.*



4. 피펫으로 1mL씩의 Total Inorganic Nitrogen Pretreatment Base Concentrate를 두개의 Total Inorganic Nitrogen Pretreatment Diluent Vial에 각각 담는다.



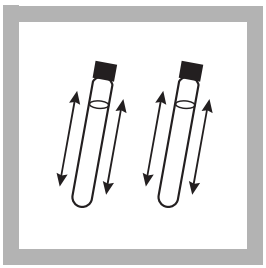
5. 피셋으로 샘플 1mL을 1 TIN Diluent Vial에 담고 (the sample), 증류수를 1mL 다른 바이알에 담는다. (the blank) 바이알 뚜껑을 닫고 30초간 흔들어 섞는다.



6. Total Inorganic Nitrogen Reductant ampule을 각 바이알에 첨가한다.

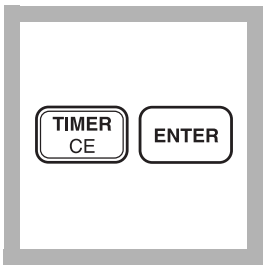
Note: *For safety, wear gloves while breaking the ampules.*

Note: *A black precipitate will form immediately.*



7. 바이알 뚜껑을 닫고 가볍게 30초 가량 흔들어서 시약을 섞어준다. 바이알을 최소 1분가량 안정시킨다.

Note: *The precipitate should remain black after shaking. Excessive shaking will cause a white precipitate and low results.*

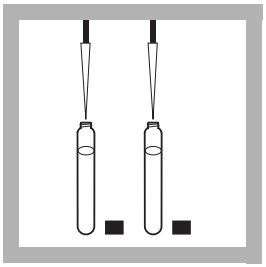


8. 바이알을 3분동안 원심분리 하거나 고체가 바이알 바닥에 가라 앉을 때까지 안정화 시킨다.

TIMER ENTER 버튼 입력.

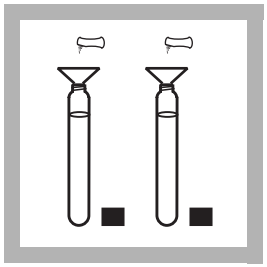
타이머 시작과 동시에 바로 원심 분리를 시작한다.

Note: *The precipitate will settle without using a centrifuge, but it may take up to 30 minutes.*

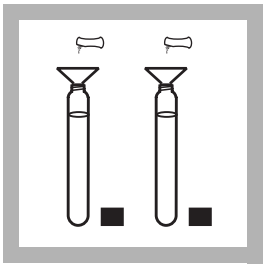


9. 2 AmVer Diluent Reagent Test 'N Tube for Low Range Ammonia Nitrogen 두개를 뚜껑을 연다.
피펫으로 1바이알에서 원심분리 된 샘플 2mL을 옮겨담는다.
blank도 다른 바이알로 옮겨담는다. 바이알을 구별할 수 있게 한다.

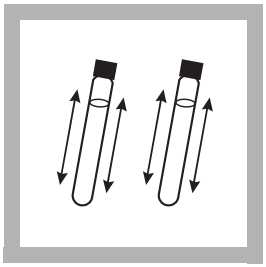
Note: *Pipet carefully to avoid disturbing the sediment.*



10. Ammonia Salicylate Reagent Powder Pillow를 각 셀에 하나씩 첨가한다.

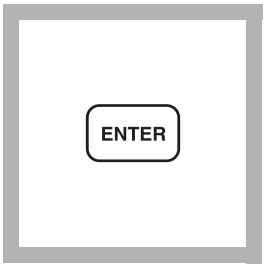


11. Ammonia Cyanurate Reagent Powder Pillow를 각 셀에 하나씩 첨가한다.



12. 뚜껑을 닫고 파우더가 용해 될 때 까지 흔들어 준다.

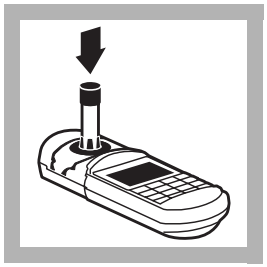
Note: *A green color will develop if inorganic nitrogen is present.*



13. 화면에 다음처럼 표시: **15:00 TIMER 2**

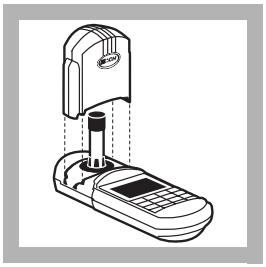
ENTER키를 누른다.

15분간의 반응시간이 나타난다.

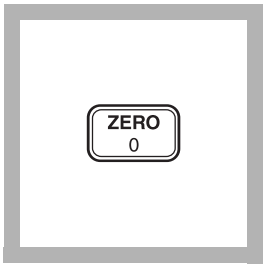


14. 타이머가 울린 후, 바이알의 표면을 닦는다. blank를 아답타에 맞춰 끼운다. 바이알을 옆으로 움직이지 않도록한다. 에러가 발생할 수 있다.

Note: *Wipe with a damp cloth and follow with a dry one to remove fingerprints and other marks.*



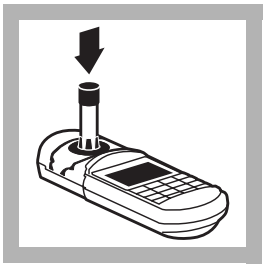
15. 기기 덮개를 덮는다.



16. ZERO키를 누른다.

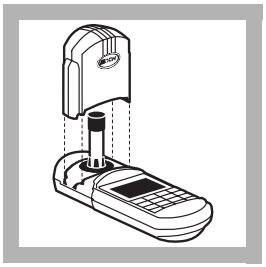
화면에 다음처럼 표시된다:

0.0 mg/L N

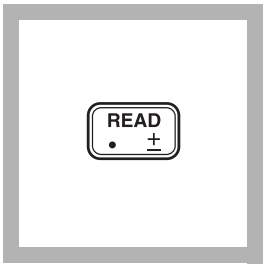


17. 측정할 샘플을 아답타에 맞춰 끼운다.

__Note:__ Do not move the vial from side to side as this can cause errors.



18. 기기 덮개를 덮는다.



19. READ키를 누른다.

화면에 결과치가 mg/L total inorganic nitrogen으로 나타난다.

__Note:__ Standard Adjust may be performed using a prepared standard (see Section 1).

REQUIRED REAGENTS

Total Inorganic Nitrogen Pretreatment Reagent Set ($TiCl_3$ Reduction) (25 tests) 26049-45
Includes: (1) 26051-50, (1) 2040-59, *(50) TIN Pretreatment Diluent Vials

AmVer™ Reagent Set for Nitrogen, Ammonia, Low Range (25 tests) 26045-45
Includes: (1) 23952-66, (1) 23954-66 , (1) 272-42, *(50) AmVer™ Diluent LR Vials

Description	Quantity Required Per Test	Unit	Cat. No.
Total Inorganic Nitrogen Pretreatment Diluent Vials	2 vials	50/pkg	*
Total Inorganic Nitrogen Reductant Ampules	2 ampules	50/pkg	26051-50
Total Inorganic Nitrogen Pretreatment Base Concentrate	2 mL	50 mL	2040-59
AmVer™ Diluent Reagent, Low Range Vials	2 vials	50/pkg	*
Ammonia Salicylate Reagent Powder Pillows for 5-mL sample	2 pillows	50/pkg	23952-66
Ammonia Cyanurate Reagent Powder Pillows for 5-mL sample	2 pillows	50/pkg	23954-66

REQUIRED APPARATUS

Centrifuge, 115V	1	each	26765-00
Centrifuge, 230V	1	each	26765-02
COD/TNT Vial Adapter	1	each	48464-00
Funnel, micro	1	each	25843-35
Pipet, TenSette®, 0.1 to 1.0	1	each	19700-01
Pipet Tips for 19700-01	2	50/pkg	21856-96
Test Tube Rack	1	each	18641-00

OPTIONAL REAGENTS

Hydrochloric Acid, ACS	500 mL	134-49
Nitrate Nitrogen Standard Solution, 10 mg/L NO_3^--N	500 mL	307-49
Nitrate Nitrogen Standard Solution, PourRite Ampules, 500 mg/L NO_3^--N, 2 mL	20/pkg	14260-20
Sodium Hydroxide Standard Solution, 5.0 N	50 mL SCDB	2450-26
Sodium Thiosulfate Standard Solution, 0.1 N	100 mL MDB	323-32
Wastewater Effluent Standard, Inorganics (NH_3–N, NO_3–N, PO_4, COD, SO_4, TOC)	500 mL	28332-49
Water, deionized	4 L	272-56

* These items are not sold separately. Please order the complete set (cat. no. 26049-45 or 26045-45).

178OPTIONAL APPARATUS

Description	Quantity Required Per Test	Unit	Cat. No.
Cylinder, graduated, mixing, 25 mL		each	20886-40
Flask, volumetric, Class A, 50.0 mL		each	14574-41
pH Indicator Paper, 1 to 11 pH	5	rolls/pkg	391-33
Pipet, volumetric, Class A, 2.0 mL		each	14515-36
Pipet Tips, for 19700-01 TenSette Pipet		1000/pkg	21856-28
PourRite Ampule Breaker		each	24846-00

For Technical Assistance, Price and Ordering

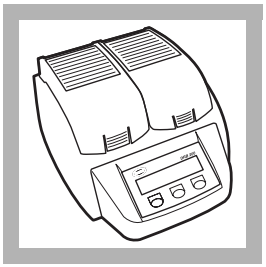
In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

NITROGEN, TOTAL, Test ‘N Tube (0.0 to 25.0 mg/L N)

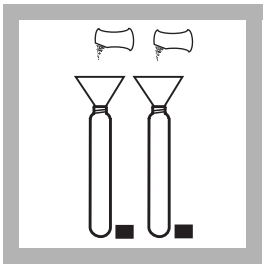
TNT Persulfate Digestion Method

For water and wastewater



1. DRB200 가열 전처리기를 켜서 103 ~106 °C로 가열한다. (최적 온도는 105 °C 이다.)

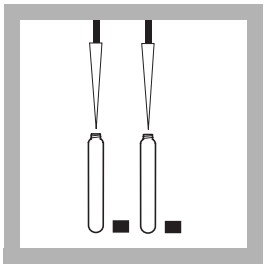
Note: *For proof of accuracy, run a 20 mg/L NH_3-N standard through digestion and analysis.*



2. Total Nitrogen Persulfate Reagent Powder Pillow를 두개의 Total Nitrogen Hydroxide Reagent vial에 하나씩 첨가한다.

Note: *Wipe off any reagent that may get on the lid or the tube threads.*

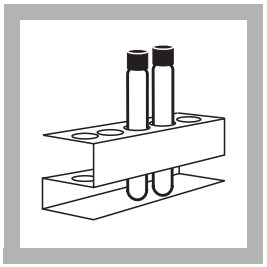
Note: *One reagent blank is sufficient for each set of samples.*



3. 2mL의 샘플을 한 바이알에 담고, 다른 한 바이알엔 증류수를 담는다.(the reagent blank) 두 바이알의 뚜껑을 닫고 30여초간 강하게 흔들어 준다. 예열된 전처리기에 넣고 30 분간 가열한다.

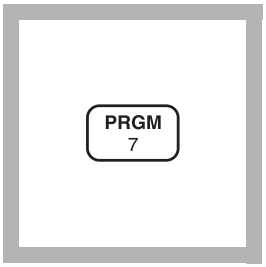
Note: *The reagent may not dissolve completely after shaking.*

Note: *Alternate water must be free of all nitrogen-containing species.*



4. 가열이 끝난 후, 뜨거워진 바이알을 조심히 꺼내서 실온으로 공냉시킨다.

Note: *It is very important to remove the vials from the Reactor after exactly 30 minutes.*

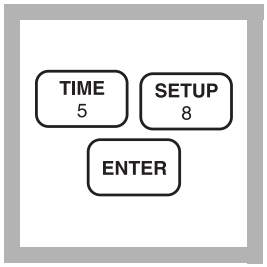


5. Test 'N Tube Total Nitrogen 항목 측정번호를 선택한다.

Press: **PRGM**

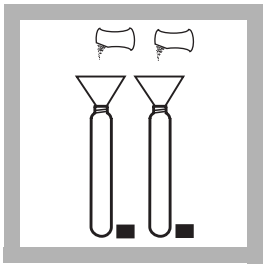
The display will show:

PRGM ?



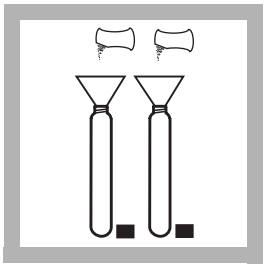
6. 58번을 선택하고 **ENTER.** 화면에 **mg/L, N**과 **ZERO** 이 표시**.**

Note: *For alternate forms (NH_3, NO_3), press the* **CONC** *key.*



7. 공냉된 바이알의 뚜을 열고 TN Reagent A Powder Pillow를 각 바이알에 하나씩 첨가한다. 다시 뚜껑을 닫고 15초정도 흔들어서 섞어준다. 흔든 후에 **TIMER ENTER** 버튼을 누른다.

3분간의 반응시간이 표시된다.



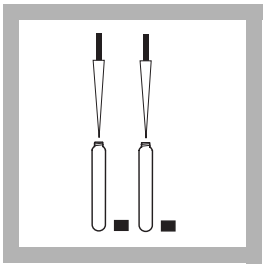
8. 타이머가 울린 후, 바이알 뚜껑을 열고 TN Reagent B Powder Pillow를 각 바이알에 첨가한다. 다시 뚜껑을 닫고 15초간 흔들어준다. 화면에 다음처럼 표시된다:

02:00 Timer 2

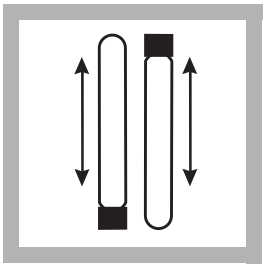
흔들어 준 뒤에 **ENTER** 키를 누른다.

2분간의 반응 시간이 표시된다.

Note: *The reagent will not completely dissolve. The solution will begin to turn yellow.*

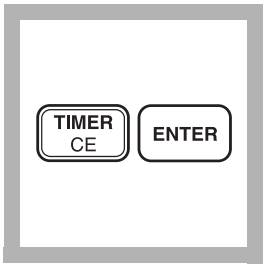


9. 타이머가 울린 후 TN Reagent C Vial 두개를 뚜껑을 연다.
앞서 전처리된 바이알에서 측정할 샘플과 blank를 각각 2mL씩 TN Reagent C Vial로 옮겨 담는다.



10. 10회정도 천천히 뒤집어서 완전히 섞어준다. 바이알의 온도가 조금 올라가게 된다.

Note: *Follow these instructions for inversion or low results may occur. Hold the vial vertical with the cap up. Invert the vial and wait for all of the solution to flow to the cap end. Pause. Return the vial to the upright position and wait for all of the solution to flow to the vial bottom. This is one inversion (10 inversions = 30 seconds).*

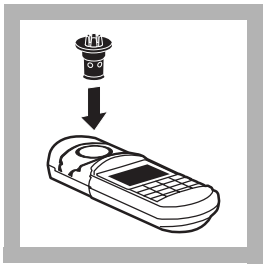


11. 화면에 다음처럼 표시: **05:00 Timer 3**

ENTER키를 누른다.

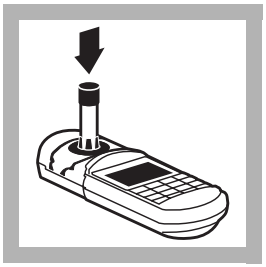
5분간의 반응 시간이 나타난다.

Note: *The yellow color will intensify.*



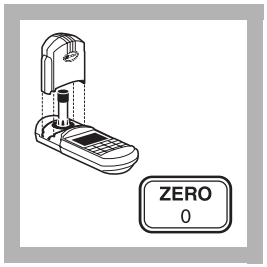
12. 반응 시간 동안 COD/TNT 아답타를 셀 홀더에 맞춰 끼운다.

Note: *For increased performance, a diffuser band covers the light path holes on the adapter. Do not remove the diffuser band.*



13. 타이머가 울린 후, blank를 옮겨담은 TN Reagent C vial을 아답타에 맞춰 넣는다.

Note: *Do not move the vial from side to side as this can cause errors.*



14. 기기 덮개를 덮는다.

ZERO키를 누른다.

화면에 다음처럼 나타난다:

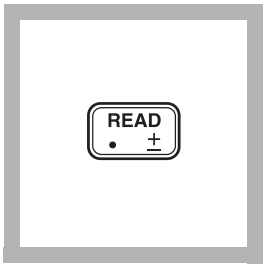
0.0 mg/L N

Note: *Wiping with a damp towel, followed by a dry one, will remove fingerprints or other marks.*

Note: *The reagent blank is stable when stored in the dark; see* Blanks For Colorimetric Measurement *following these steps.*

15. 측정할 샘플이 든 TN Reagent C vial을 아답타에 넣고 기기 덮개를 덮는다.

Note: *Multiple samples may be read after zeroing on one reagent blank.*



16. **READ**키를 누른다.

화면에 결과치가 mg/L nitrogen (N)으로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Standard Adjust in Section 1).*

Note: *If the display flashes “limit”, dilute the sample and repeat the digestion and the colorimetric finish. The digestion must be repeated for accurate results; diluting and repeating the color finish does not yield complete results. Multiply the result by the dilution factor; see Section 1.*

REQUIRED REAGENTS

Description	Cat. No.
Test ’N Tube Total Nitrogen Reagent Set (50 vials)	26722-45
Includes:	
TN Reagent C Vials, Acid Solution*, 50/pkg	26721-45
TN Hydroxide Reagent Sample Digestion Vials*, 50/pkg	26717-45

Description	Quantity Required Per Test	Unit	Cat. No.
TN Persulfate Reagent Powder Pillows	2 pillows	100 / pkg	26718-49
TN Reagent A, Bisulfite Powder Pillows	2 pillows	100 / pkg	26719-49
TN Reagent B, Indicator Powder Pillows	2 pillows	100 / pkg	26720-49

REQUIRED APPARATUS

DRB 200 Reactor, 110 V, 15 x 16 mm tubes			LTV082.53.40001
DRB 200 Reactor, 220 V, 15 x 16 mm tubes			LTV082.52.40001
COD / TNT Adapter	1	each	48464-00
Funnel, micro	1	each	25843-35
Pipet, TenSette, 1.0-10.0 mL	1	each	19700-10
Pipet Tips for 19700-10	1	50 / pkg	21997-96
Pipet, TenSette, 0.1 to 1.0 mL	1	each	19700-01
Pipet Tips for 19700-01	2	50 / pkg	21856-96
Test Tube Cooling Rack	1-3	each	18641-00

OPTIONAL REAGENTS

Description	Quantity Required Per Test	Unit	Cat. No.
Nitrogen,Ammonia, 100 mg / L NH_3-N	500 mL	24065-49	
Nitrogen, Ammonia, Voluette Ampule, 160 mg/L NH_3–N, 10 mL		16/pkg	21091-10
Sulfuric Acid, ACS		500 mL	979-49
Primary Standards for Kjeldahl Nitrogen		set of 3	22778-00
Ammonium p-Toluenesulfonate		25 g	22779-24
Glycine p-Toluenesulfonate		25 g	22780-24
Nicotinic Acid p-Toluenesulfonate		25 g	22781-24
Sodium Hydroxide Standard Solution, 5.0 N		50 mL MDB	2450-26
Wastewater Effluent Standard, Inorganics (NH_3–N, NO_3–N, PO_4, COD, SO_4, TOC)		500 mL	28332-49
Water, organic-free		500 mL	26415-49

* Not available separately.

OPTIONAL APPARATUS

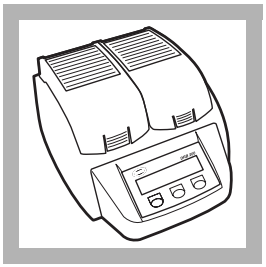
Ampule Breaker Kit ..... each 21968-00
Balance, analytical, 115 VAC ..... each 28014-01
Balance, analytical, 230 VAC ..... each 28014-02
Cots, finger 2/pkg 14647-02
Cylinder, graduated, mixing, 25 mL (3 required) ..... each 26363-40
Flask, volumetric, Class A, 1000 mL (3 required) ..... each 14574-53
Flask, volumetric, Class A, 100 mL ..... each 14574-42
Pipet, volumetric, Class A, 20 mL ..... each 14515-20
Pipet Tips, for 19700-01 TenSette Pipet 1000/pkg 21856-28
pH Paper, 1 to 11 pH units ..... 5 rolls/pkg 391-33

DRB 200 Reactor, 110 V, 21 x 16 mm and 4 x 20 mm LTV082.53.42001
DRB 200 Reactor, 220 V, 21 x 16 mm and 4 x 20 mm LTV082.52.42001
DRB 200 Reactor, 110 V, 9 x 16 mm and 2 x 20 mm LTV082.53.30001
DRB 200 Reactor, 220 V, 9 x 16 mm and 2 x 20 mm LTV082.52.30001

NITROGEN, TOTAL, HR, Test ‘N Tube™ (10.0 to 150.0 mg/L N)

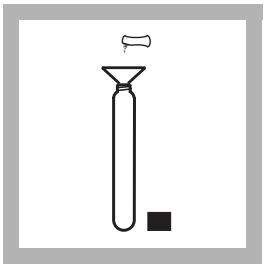
TNT Persulfate Digestion Method

For water and wastewater



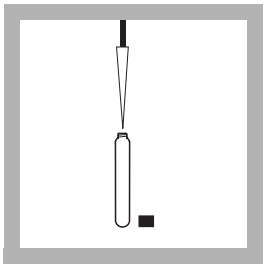
1. DRB200를 예열 시킨다. 온도는 103 ~106 °C로 맞춘다. (최적 온도는 105 °C이다.)

Note: *For proof of accuracy, run a 125 mg/L NH_3-N standard through digestion and analysis.*



2. Reagent blank 준비: Total Nitrogen Persulfate Reagent Powder Pillow를 HR Total Nitrogen Hydroxide Digestion Vial에 첨가한다.

Note: *Wipe off any reagent that gets on the lid or the tube threads.*



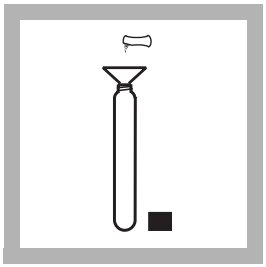
3. 0.5mL의 증류수를 바이알에 담는다. 뚜껑을 닫고 30초간 매우 강하게 흔든다. Reagent blank 제작과 같은 과정을 통해서 측정할 샘플을 준비한다.

Note: *Alternate water must be free of all nitrogen-containing species.*

Note: *The persulfate reagent may not dissolve completely after shaking.*

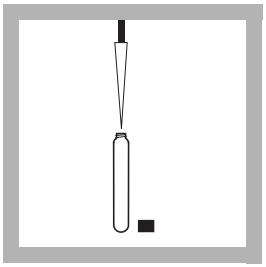
Note: *One reagent blank is sufficient for each set of samples using the same lots of reagents.*

Note: *The reagent blank is stable for as long as seven days when stored in the dark; see* Blanks for Colorimetric Measurement *following this procedure.*



4. Sample 준비: Total Nitrogen Persulfate Reagent Powder Pillow를 HR Total Nitrogen Hydroxide Digestion Vial에 첨가한다.

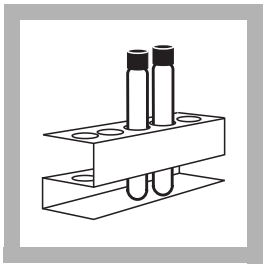
Note: *Wipe off any reagent that gets on the lid or the tube threads.*



5. 0.5mL의 샘플을 바이알에 담고 30초간 매우 강하게 흔들어 준다.

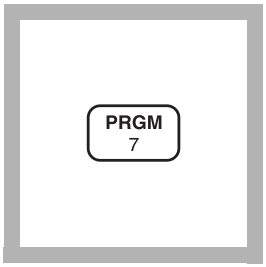
Note: *The persulfate reagent may not dissolve completely after shaking.*

6. 바이알들을 예열된 전처리기에 넣고 30분간 가열한다.



7. 가열이 끝난 후, 뜨거워진 바이알을 조심히 꺼내서 실온으로 공냉시킨다.

Note: *It is very important to remove the vials from the Reactor after exactly 30 minutes.*

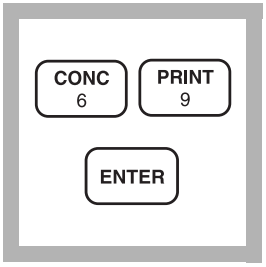


8. Test 'N Tube HR Total Nitrogen 측정번호를 선택한다.

Press: **PRGM**

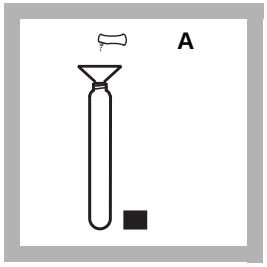
The display will show:

PRGM ?



9. 69번을 선택하고 **ENTER.** 화면에 **mg/L, N**와 **ZERO** 아이콘이 표시**.**

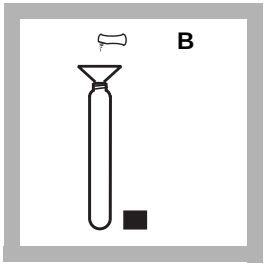
Note: *For alternate forms (NH_3, NO_3), press the* **CONC** *key.*



10. Total Nitrogen Reagent A Powder Pillow를 각각 blank와 측정할 샘플에 첨가하고 뚜껑을 닫은 뒤 15초간 흔들어 준다. 흔들어 준 후에 다음 버튼을 누른다:

TIMER ENTER

3분간의 반응 시간이 표시된다.



11. 타이머가 울린 후, Total Nitrogen Reagent B Powder Pillow를 각 바이알에 첨가하고 뚜껑을 닫은뒤 15초간 흔들어서 섞어준다.

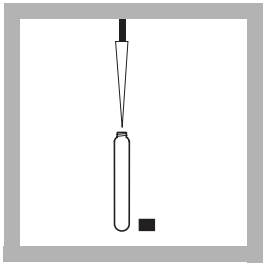
화면에 다음처럼 표시:

02:00 Timer 2

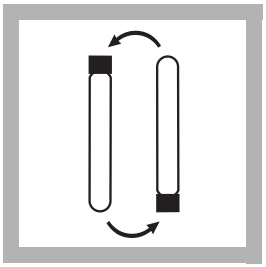
흔들어준 후에 **ENTER** 키를 누른다.

2분간의 반응 시간이 나타난다.

Note: *The reagent will not completely dissolve. The solution will begin to turn yellow.*

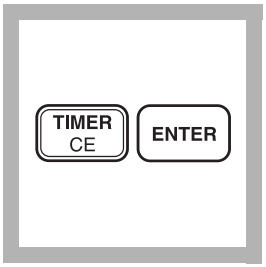


12. 타이머가 울린 후, Total Nitrogen Reagent C Vial을 두개 준비한다. 뚜껑을 열고 전처리된 바이알에서 각각 2mL씩 옮겨 담는다. 바이알의 온도가 조금 올라간다.



13. 뚜껑을 닫고 천천히 10여회 뒤집어서 섞어 준다.

Note: *Proper mixing is important for complete recovery. Hold the vial vertical with the cap up. Invert the vial and wait for all of the solution to flow to the cap end. Pause. Return the vial to the upright position and wait for all of the solution to flow to the vial bottom. This is one inversion (10 inversions = 30 seconds).*



14. 화면에 다음처럼 표시: **05:00 Timer 3**

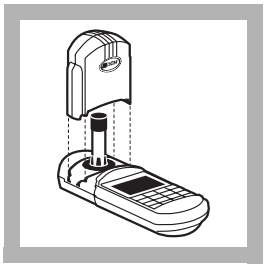
ENTER키를 누른다.

5분간 반응 시간이 나타난다. 바이알을 다시 뒤집지 않는다.

Note: *The yellow color will intensify.*

15. COD/TNT 아답타를 셀 홀더에 맞춰 끼운다.

Note: *For increased performance, a diffuser band covers the light path holes on the adapter. Do not remove the diffuser band.*

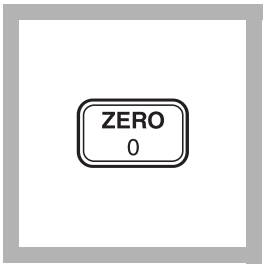


16. 타이머가 울린 후, blank가 든 바이알 표면을 닦은 후 Hach 로고가 정면으로 오게 해서 아답타에 맞춰 끼운다.

기기 덮개를 덮는다.

Note: *Do not move the vial from side to side during insertion, as this can cause errors.*

Note: *Wipe with a damp towel, followed by a dry one, to remove fingerprints or other marks.*



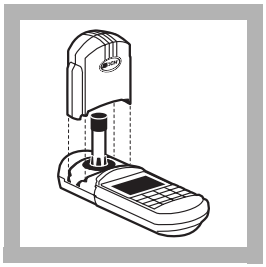
17. ZERO키를 누른다.

화면에 다음처럼 나타난다:

0 mg/L N

18. 측정할 샘플이 담긴 바이알의 표면을 깨끗이 닦아준다.

Note: *Wipe with a damp towel, followed by a dry one, to remove fingerprints or other marks.*

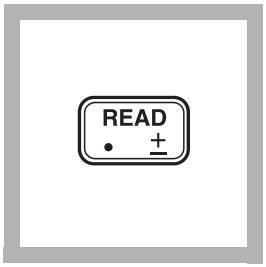


19. 바이알을 Hach 로고가 정면으로 오게 해서 아답타에 맞춰 끼운다.

기기 덮개를 덮는다.

Note: *Do not move the vial from side to side during insertion, as this can cause errors.*

Note: *Multiple samples may be read after zeroing on one reagent blank.*



20. READ키를 누른다.

화면에 결과치가 mg/L nitrogen (N)으로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see* Standard Adjust *in* Section1 *of the Procedures Manual).*

Note: *If the display flashes* **Limit**, *dilute the sample and repeat the digestion and the colorimetric finish. The digestion must be repeated for accurate results; diluting and repeating the color finish does not yield complete results. Multiply the result by the dilution factor; see SECTION 1.*

REQUIRED REAGENTS

Test ’N Tube HR Total Nitrogen Reagent Set (50 vials) 27141-00
Includes: (1) 26718-46, (1) 26719-46, (1) 26720-46, *(50) Hydroxide Digestion Vials, *(50) Acid Solution Vials

Description	Quantity Required Per Test	Unit	Cat. No.
HR Total Nitrogen Hydroxide Digestion Vials	1 vial	50/pkg	*
Total Nitrogen Persulfate Reagent Powder Pillows	1 pillow	50/pkg	26718-46
Total Nitrogen Reagent A, Bisulfite Powder Pillows	1 pillow	50/pkg	26719-46
Total Nitrogen Reagent B, Indicator Powder Pillows	1 pillow	50/pkg	26720-46
Total Nitrogen Reagent C Vials, Acid Solution	1 vial	50/pkg	*

REQUIRED APPARATUS

DRB 200 Reactor, 110 V, 15 x 16 mm tubes			LTV082.53.40001
DRB 200 Reactor, 220 V, 15 x 16 mm tubes			LTV082.52.40001
COD/TNT Adapter	1	each	48464-00
Funnel, micro	1	each	25843-35
Pipet, TenSette, 0.1 to 1.0 mL	1	each	19700-01
Pipet Tips for 19700-01	2	50/pkg	21856-96
Test Tube Rack, for cooling vials	1-3	each	18641-00

OPTIONAL REAGENTS

Nitrogen, Ammonia, 1000 mg/L NH_3-N	1 L	23541-53
Nitrogen, Ammonia, Voluette Ampule, 1000 mg/L NH_3-N, 10 mL	16/pkg	23541-10
Sulfuric Acid, ACS	500 mL	979-49
Primary Standards for Kjeldahl Nitrogen	set of 3	22778-00
Ammonium p-Toluenesulfonate	25 g	22779-24
Glycine p-Toluenesulfonate	25 g	22780-24
Nicotinic Acid p-Toluenesulfonate	25 g	22781-24
Sodium Hydroxide Standard Solution, 5.0 N	50 mL MDB	2450-26
Wastewater Influent Standard, Inorganics (NH_3–N, NO_3–N, PO_4, COD, SO_4, TOC)	500 mL	28331-49
Water, organic-free	500 mL	26415-49

* These items are not sold separately. Please order the complete set (Cat. No. 27141-00) as a replacement.

OPTIONAL APPARATUS

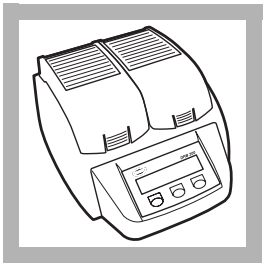
Description		Unit	Cat. No.
Ampule Breaker Kit		each	21968-00
Balance, analytical, 115 Vac		each	28014-01
Balance, analytical, 230 Vac		each	28014-02
Cots, finger		2/pkg	14647-02
Cylinder, graduated, mixing, 25 mL	3	each	26363-40
DRB 200 Reactor, 110 V, 21 x 16 mm and 4 x 20 mm			LTV082.53.42001
DRB 200 Reactor, 220 V, 21 x 16 mm and 4 x 20 mm			LTV082.52.42001
DRB 200 Reactor, 110 V, 9 x 16 mm and 2 x 20 mm			LTV082.53.30001
DRB 200 Reactor, 220 V, 9 x 16 mm and 2 x 20 mm			LTV082.52.30001
Flask, volumetric, Class A, 1000 mL	3	each	14574-53
Flask, volumetric, Class A, 200 mL		each	14574-45
Pipet, volumetric, Class A, 25 mL	2	each	14515-40
Pipet Tips, for 19700-01 TenSette Pipet		1000/pkg	21856-28
pH Paper, 1 to 11 pH units		5 rolls/pkg	391-33

For Technical Assistance, Price and Ordering

In the U.S.A.—Call 800-227-4224. Out side the U.S.A— Contact the Hach office or distributor serving you.
Outside the U.S.A.—Contact the Hach office or distributor serving you.

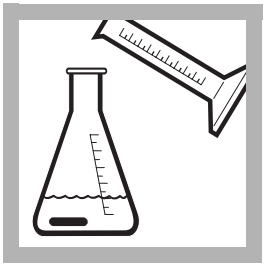
ORGANIC CARBON, TOTAL, Low Range (0.0–20.0 mg/L C)

Direct Method* **For water, drinking water, and wastewater**

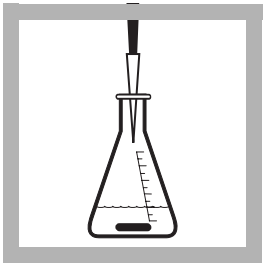


1. DRB 200 가열 전처리기를 켜서 103-105 °C로 예열한다.

Note: *See DRB 200 user manual for selecting pre-programmed temperature applications.*

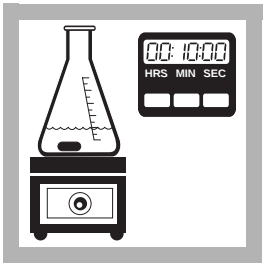


2. 눈금 실린더를 사용해서 샘플 10mL을 stir bar가 들어있는 50mL erlenmeyer flask에 담는다.

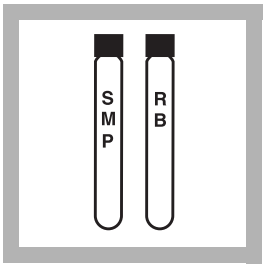


3. pH2.0의 Buffer Solution을 0.4mL 첨가.

Note: *Use pH paper to make sure the sample pH is 2.*

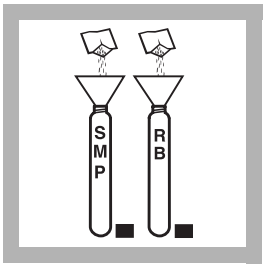


4. 플라스크를 교반기에 올리고 10분간 중간속도로 교반한다.

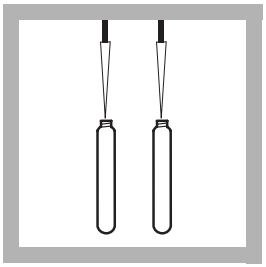


5. Low Range Acid Digestion vial 두개 준비 : **sample**과 **reagent blank**를 표시한다.

Note: *A reagent blank is required for each series of samples.*



6. 각 바이알에 TOC Persulfate Powder Pillow를 하나씩 첨가한다. (무색 액체)

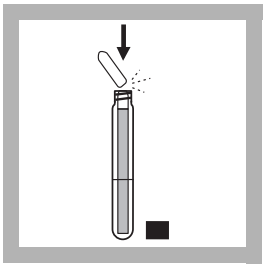


7. TenSette® Pipet을 사용해서 증류수 3.0mL을 **reagent blank**바이알에 담고, 교반한 샘플을 **sample** 바이알에 3.0mL 담는다. 휘저어 섞어준다.

8. 두개의 푸른색 Indicator Ampule을 증류수로 세척하고 표면을 깨끗이 닦아준다.

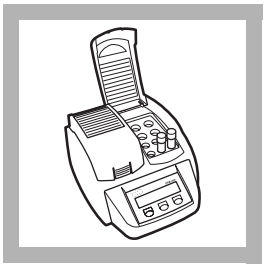
Note: Do not touch the ampules on the sides after wiping. Pick them up by the top.

* Patent pending

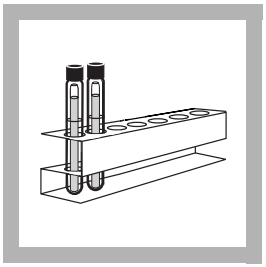


9. 앰퓰을 열지 않고 각 Acid Digestion vial에 밀어 넣는다. 앰퓰 위쪽에 새겨진 금이 바이알 위쪽에 맞을 때 앰퓰의 위쪽을 꺽어서 연다. 앰퓰이 바이알 안으로 들어가게 한다.

Note: Do not invert or tilt the vial after inserting the ampule to prevent the Indicator Reagent from mixing with the contents of the acid digestion vial.

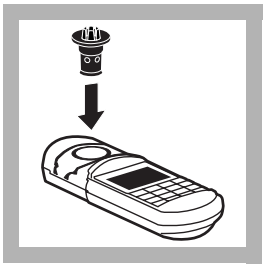


10. 앰퓰이 들어간 바이알들을 단단히 닫아서 예열된 전처리기에서 두시간 동안 가열한다. (103-105 °C)



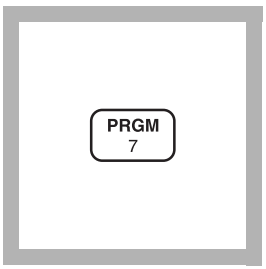
11. 가열된 바이알들을 조심히 꺼내서 랙에 두도록 한다. 정확한 결과치를 얻기 위해

1시간 동안 냉각시킨다.



12. COD/TNT를 셀 홀더에 맞춰 끼운다.

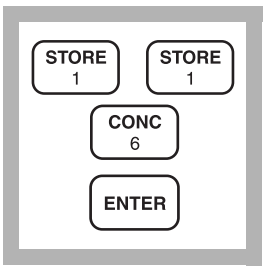
Note: *For increased performance, a diffuser band covers the light path holes on the adapter. Do not remove the diffuser band.*



13. Low Range TOC 측정항목의 번호를 선택한다.

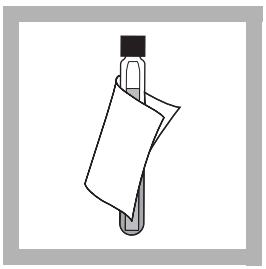
Press: **PRGM**

The display will show:
PRGM?



14. **116**번을 선택하고

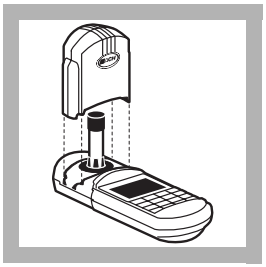
ENTER. 화면에 **mg/L**와 **ZERO** 아이콘이 나타난다.



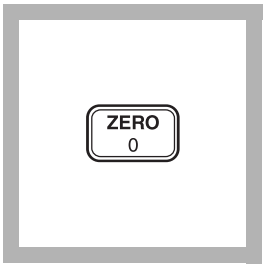
15. reagent blank 바이알의 표면을 깨끗이 닦는다.

Note: *The liquid in the reagent blank vial should be dark blue.*

16. **reagent blank** 바이알을 아답타에 맞춰 끼운다.

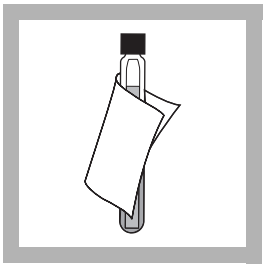


17. 기기 덮개를 덮는다.



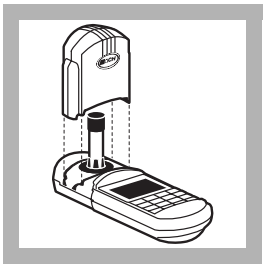
18. **ZERO**키를 누른다.

화면에 다음처럼
나타난다:
0.0 mg/L C

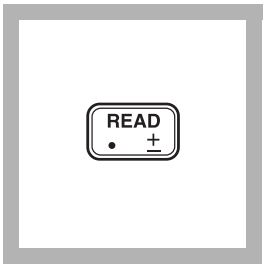


19. 샘플 바이알을
깨끗이 닦는다.

20. **sample** 바이알을
아답타에 맞춰 끼운다.



21. 기기 덮개를 덮는다.



22. **READ**키를 누른다.

화면에 결과치가
mg/L C로 나타난다.

REQUIRED REAGENTS

Description	Qty/Test	Unit	Cat. No.
Total Organic Carbon Direct Method Low Range Test 'N Tube Reagent Set	50	vials	27603-45
Includes:			
Acid Digestion Solution Vials, Low Range TOC	1	50/pkg	*
Buffer Solution, Sulfate	0.4 mL	25 mL	452-33
Funnel, micro	1	each	25843-35
Indicator Ampules, Low Range TOC	1	10/pkg	*
TOC Persulfate Powder Pillows	1	50/pkg	*
Water, organic-free**	3.0 mL	500 mL	26415-49

REQUIRED APPARATUS

Description	Qty/Test	Unit	Cat. No.
Cylinder, graduated, 10-mL	1	each	508-38
DRB 200 Reactor, 110 V, 15 x 16 mm tubes			LTV082.53.40001
DRB 200 Reactor, 220 V, 15 x 16 mm tubes			LTV082.52.40001
Flask, Erlenmeyer, 50-mL	1	each	505-41
Magnetic Stirrer, 115 V, 4" x 4"	1	each	28812-00
Test Tube Rack	1-3	each	18641-00
Pipet, TenSette®, 0.1 to 1.0 mL	1	each	19700-01
Pipet, TenSette®, 1.0 to 10.0 mL	1	each	19700-10
Pipet Tips, for 19700-01 TenSette® Pipet	2	50/pkg	21856-96
Pipet Tips, for 19700-10 TenSette® Pipet	2	50/pkg	21997-96
Stir Bar, Magnetic	1	each	45315-00
Wipes, Disposable, Kimwipes	1	280/pkg	20970-00

OPTIONAL REAGENTS

Potassium Acid Phthalate	500 g		315-34
Sulfuric Acid Reagent Solution, 5.25 N	100 mL	MDB	2449-32
TOC Standard Solution Ampules (KHP Standard, 1000 mg/L C)	5/pkg		27915-05
Wastewater Effluent Standard, Inorganic (NH_3–N, NO_3–N, PO_4, COD, SO_4, TOC)	500 mL		28332-49

* These items are not sold separately.
** This item must be purchased separately.

OPTIONAL APPARATUS

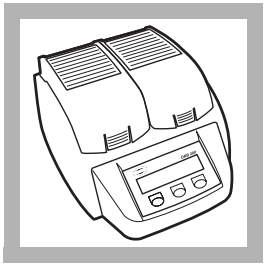
Analytical Balance .....each 28014-01
DRB 200 Reactor, 110 V, 21 x 16 mm and 4 x 20 mm..... LTV082.53.42001
DRB 200 Reactor, 220 V, 21 x 16 mm and 4 x 20 mm..... LTV082.52.42001
DRB 200 Reactor, 110 V, 9 x 16 mm and 2 x 20 mm..... LTV082.53.30001
DRB 200 Reactor, 220 V, 9 x 16 mm and 2 x 20 mm..... LTV082.52.30001
Flask, volumetric, 100-mL .....each 14574-42
Pipet, Class A, 200-mL .....each 14515-35
Pipet, Class A, 15.00-mL .....each 14515-39

ORGANIC CARBON, TOTAL, Mid Range

(15–150 mg/L C)

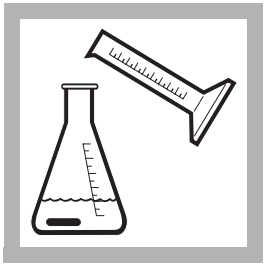
Direct Method*

For wastewater and industrial waters



1. DRB200 가열 전처리기를 켜서 103–105 °C로 예열한다.

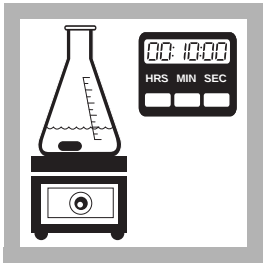
Note: *See DRB 200 user manual for selecting pre-programmed temperature applications.*



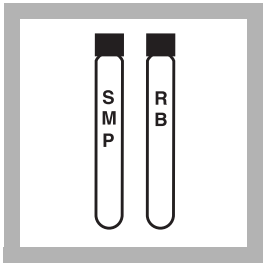
2. 눈금 실린더를 사용해서 샘플 10mL을 stir bar가 들어있는 50mL erlenmeyer flask에 담는다.

3. pH2.0의 Buffer Solution을 0.4mL 첨가.

Note: *Use pH paper to make sure the sample pH is 2.*

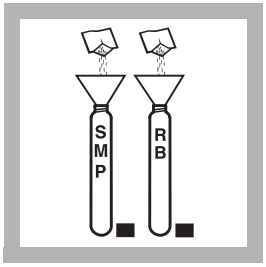


4. 플라스크를 교반기에 올려서 10분간 중간속도로 교반한다.

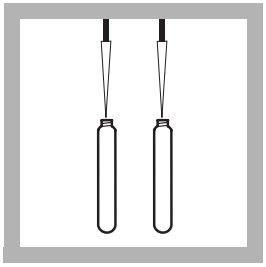


5. Mid Range Acid Digestion vial 두개 준비 : **sample**과 **reagent blank**를 표시한다.

Note: *A reagent blank is required for each series of samples.*



6. TOC Persulfate Powder Pillow를 각 바이알에 하나씩 첨가한다. (무색 액체)

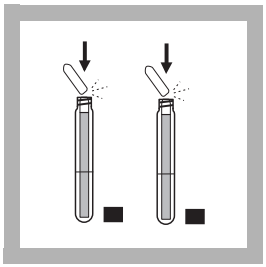


7. TenSette® Pipet을 사용해서 증류수 1.0mL을 **reagent blank**바이알에 담고, 교반한 샘플을 **sample**바이알에 담는다. 뚜껑을 닫지 않고 가볍게 저어서 섞어준다.

8. 두개의 푸른색 Indicator Ampule을 증류수로 세척하고 깨끗이 닦아준다.

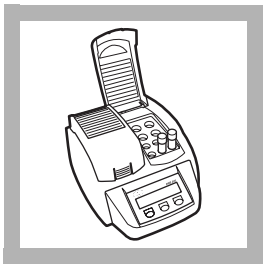
Note: Do not touch the ampules on the sides after wiping. Pick them up by the top.

* Patent pending

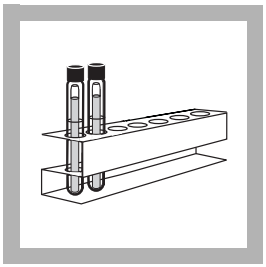


9. 앰퓰을 열지 않고 각 바이알에 하나씩 밀어 넣는다. 엠퓰 위쪽에 새겨진 금이 바이알 위쪽에 맞을 때 앰퓰을 꺽어서 연다. 앰퓰이 안으로 들어가게 한다.

Note: Do not invert or tilt the vial after inserting the ampule to prevent the Indicator Reagent from mixing with the contents of the acid digestion vial.

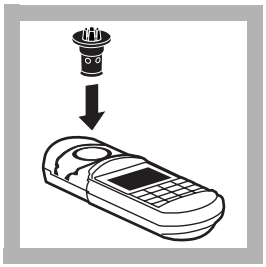


10. 바이알 뚜껑을 단단히 닫아서 예열된 가열 전처리기에 넣어 2시간 동안 가열한다. (103–105 °C)



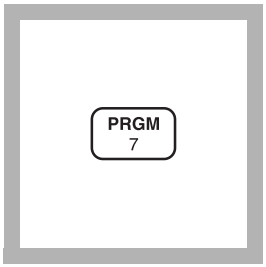
11. 가열된 바이알을 조심스럽게 꺼내서 랙에 둔다. 정확한 결과치를 위해서 1시간 동안

공냉 시킨다.



12. COD/TNT 아답타를 셀 홀더에 맞춰 끼운다.

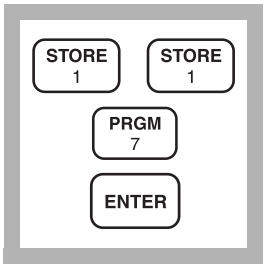
Note: *For increased performance, a diffuser band covers the light path holes on the adapter. Do not remove the diffuser band.*



13. Mid Range TOC 항목의 측정 번호를 선택한다.

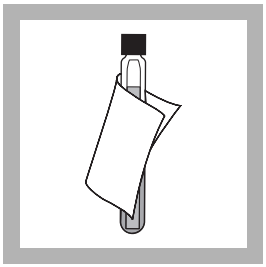
Press: **PRGM**

The display will show:
PRGM?



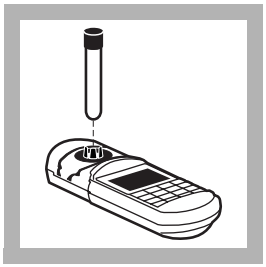
14. **117**번을 선택하고

ENTER. 화면에 **mg/L**와 **ZERO** 아이콘이 표시된다.

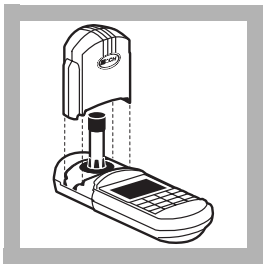


15. reagent blank 바이알의 표면을 깨끗이 닦아낸다.

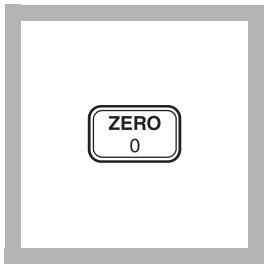
Note: *The liquid in the reagent blank vial should be dark blue.*



16. **reagent blank** 바이알을 아답타에 맞춰 끼운다.



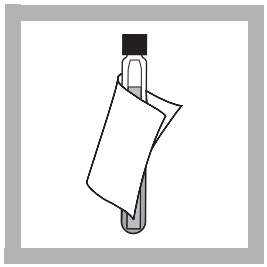
17. 기기 덮개를 덮는다.



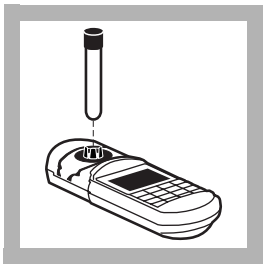
18. **ZERO**키를 누른다.

화면에 다음처럼 표시된다:

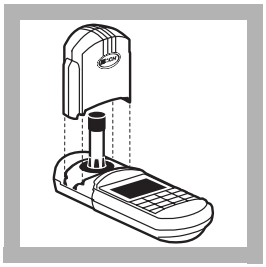
0 mg/L C



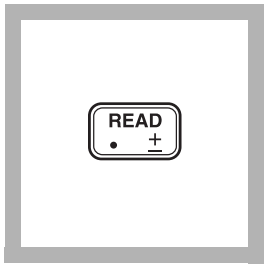
19. 측정할 샘플 바이알의 표면을 깨끗이 닦아 준다.



20. **sample** 바이알을 아답타에 맞춰 끼운다.



21. 기기 덮개를 덮는다.



22. **READ**키를 누른다.

화면에 결과치가 mg/L C로 나타난다.

REQUIRED REAGENTS

Total Organic Carbon Direct Method Mid Range
Test ’N Tube Reagent Set ..... 50 vials 28159-45

Includes:

Description	Quantity Required Per Test	Unit	Cat. No.
Acid Digestion Solution Vials, Mid Range TOC	1	50/pkg	*
Buffer Solution, Sulfate	0.4 mL	25 mL	452-33
Funnel, micro	1	each	25843-35
Indicator Ampules, Mid/High Range TOC	1	50/pkg	*
TOC Persulfate Powder Pillows	1	50/pkg	*
Water, organic-free**	1.0 mL	500 mL	26415-49

REQUIRED APPARATUS

DRB 200 Reactor, 110 V, 15 x 16 mm tubes			LTV082.53.40001
DRB 200 Reactor, 220 V, 15 x 16 mm tubes			LTV082.52.40001
Cylinder, graduated, 10-mL	1	each	508-38
Flask, Erlenmeyer, 50-mL	1	each	505-41
Magnetic Stirrer, 115 V, 4" x 4"	1	each	28812-00
Test Tube Rack	1–3	each	18641-00
Pipet, TenSette®, 0.1 to 1.0 mL	1	each	19700-01
Pipet Tips, for 19700-01 TenSette® Pipet	2	50/pkg	21856-96
Stir Bar, Magnetic	1	each	45315-00
Wipes, Disposable, Kimwipes	1	280/pkg	20970-00

OPTIONAL REAGENTS

Description	Per Test	Unit	Cat. No.
TOC Standard Solution (KHP Standard, 1000 mg/L C)		5/pkg	27915-05
Potassium Acid Phthalate		500 g	315-34
Sulfuric Acid Reagent Solution, 5.25 N		100 mL MDB	2449-32

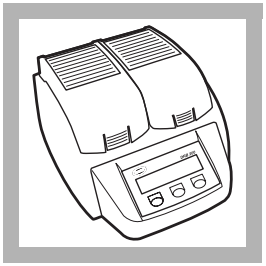
OPTIONAL APPARATUS

Analytical Balance		each	28014-01
DRB 200 Reactor, 110 V, 21 x 16 mm and 4 x 20 mm			LTV082.53.42001
DRB 200 Reactor, 220 V, 21 x 16 mm and 4 x 20 mm			LTV082.52.42001
DRB 200 Reactor, 110 V, 9 x 16 mm and 2 x 20 mm			LTV082.53.30001
DRB 200 Reactor, 220 V, 9 x 16 mm and 2 x 20 mm			LTV082.52.30001
Flask, volumetric, 100-mL		each	14574-42
Pipet, Class A, 10.00-mL		each	14515-38
Pipet, Class A, 15.00-mL		each	14515-39
Pipet Tips, for 19700-01 TenSette Pipet		1000/pkg	21856-28

* These items are not sold separately.
** This item must be purchased separately.

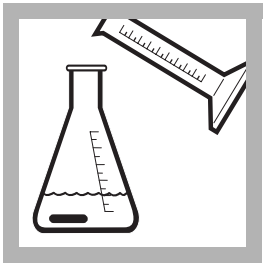
ORGANIC CARBON, TOTAL, High Range (20–700 mg/L C)

Direct Method* **For wastewater and industrial waters**



1. DRB200 가열 전처리기를 켜서 103-105 °C로 예열한다.

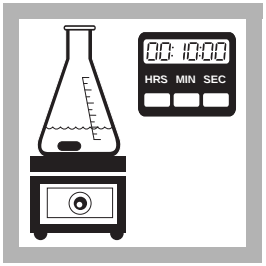
Note: *See DRB 200 user manual for selecting pre-programmed temperature applications.*



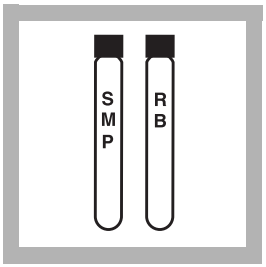
2. 눈금 실린더로 샘플 10mL을 stir bar가 든 50mL erlenmeyer flask에 담는다.

3. pH2.0의 Buffer Solution을 0.4mL 첨가.

Note: *Use pH paper to make sure the sample pH is 2.*

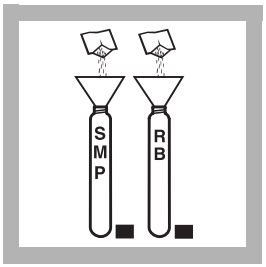


4. 플라스크를 교반기에 올리고 중간 속도로 10분간 교반한다.

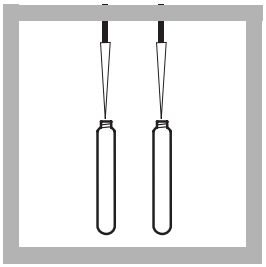


5. High Range Acid Digestion vial 두개 준비 : **sample**과 **reagent blank**를 표시한다.

Note: *A reagent blank is required for each series of samples.*



6. TOC Persulfate Powder Pillow를 하나씩 각 바이알에 첨가한다. (무색 액체)

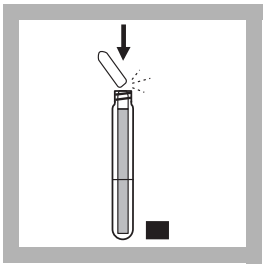


7. TenSette® Pipet으로 증류수 0.3mL을 **reagent blank**바이알에 담고, 교반한 샘플을 **sample** 바이알에 담는다. 저어서 섞어준다.

8. 증류수로 푸른색 Indicator Ampule을 세척하고 깨끗이 닦아 준다.

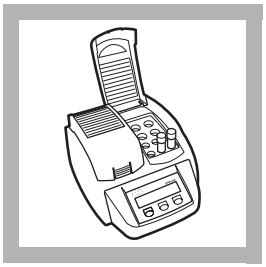
Note: Do not touch the ampules on the sides after wiping. Pick them up by the top.

* Patent pending

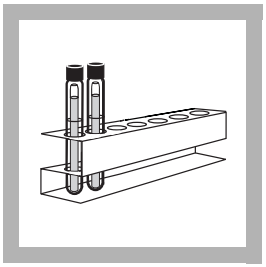


9. 앰퓰을 열지 않고 각 바이알에 하나씩 밀어 넣는다. 앰퓰에 표시된 금이 바이알 위쪽에 맞을 때 꺽어서 연다. 앰퓰이 안으로 들어가게 한다.

Note: Do not invert or tilt the vial after inserting the ampule to prevent the Indicator Reagent from mixing with the contents of the acid digestion vial.

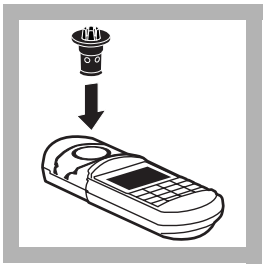


10. 앰퓰이 들어간 바이알들을 예열된 전처리기에 넣어서 2시간 동안 가열한다. (103–105 °C)



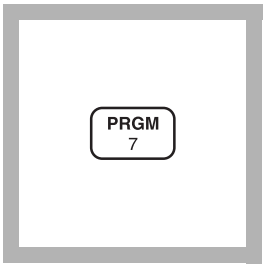
11. 가열된 바이알들을 전처리기에서 꺼내서 랙에 두고 식힌다. 정확한 결과를 위해서

1시간 동안 공냉시킨다.



12. COD/TNT 아답타를 셀 홀더에 맞춰 끼운다.

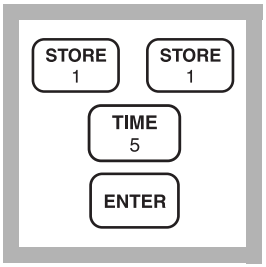
Note: *For increased performance, a diffuser band covers the light path holes on the adapter. Do not remove the diffuser band.*



13. High Range TOC 측정을 위해 프로그램 번호를 선택한다.

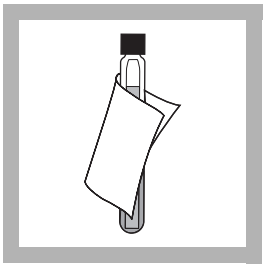
Press: **PRGM**

The display will show:
PRGM?



14. **115**번을 선택하고

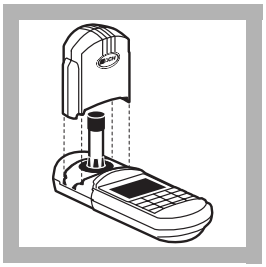
ENTER. 화면에 **mg/L**와 **ZERO** 아이콘이 표시된다.



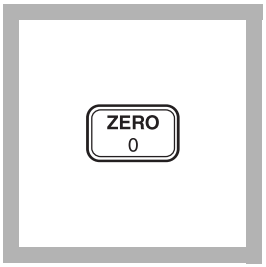
15. reagent blank바이알의 표면을 깨끗이 닦는다.

Note: *The liquid in the reagent blank vial should be dark blue.*

16. **reagent blank**바이알을 아답타에 맞춰 끼운다.

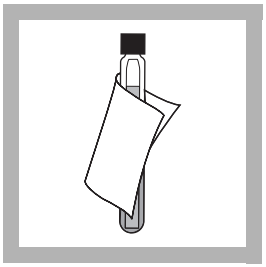


17. 기기덮개를 덮는다.



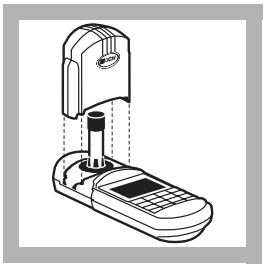
18. **ZERO**키를 누른다.

화면에 다음처럼
나타난다:
0 mg/L C

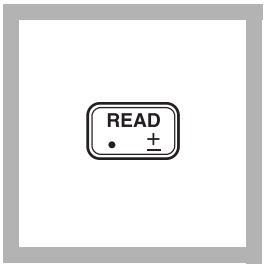


19. 측정할 샘플 바이알의 표면을 깨끗이 닦는다.

20. **sample** 바이알을 아답타에 맞춰 끼운다.



21. 기기 덮개를 덮는다.



22. **READ**키를 누른다.

화면에 결과치가
mg/L C로 나타난다.

REQUIRED REAGENTS

Total Organic Carbon Direct Method High Range
Test ’N Tube Reagent Set ..... 50 vials 27604-45

Includes:

Description	Qty/Test	Unit	Cat. No.
Acid Digestion Solution Vials, High Range TOC	1	50/pkg	*
Buffer Solution, Sulfate	0.4 mL	25 mL	452-33
Funnel, micro	1	each	25843-35
Indicator Ampules, High Range TOC	1	10/pkg	*
TOC Persulfate Powder Pillows	1	50/pkg	*
Water, organic-free**	0.3 mL	500 mL	26415-49

REQUIRED APPARATUS

Cylinder, graduated, 10-mL	1	each	508-38
DRB 200 Reactor, 110 V, 15 x 16 mm tubes			LTV082.53.40001
DRB 200 Reactor, 220 V, 15 x 16 mm tubes			LTV082.52.40001
Flask, Erlenmeyer, 50-mL	1	each	505-41
Magnetic Stirrer, 115 V, 4" x 4"	1	each	28812-00
Safety Shield, laboratory bench	1	each	50030-00
Test Tube Rack	1-3	each	18641-00
Pipet, TenSette®, 0.1 to 1.0 mL	1	each	19700-01
Pipet, TenSette®, 1.0 to 10.0 mL	1	each	19700-10
Pipet Tips, for 19700-01 TenSette® Pipet	2	50/pkg	21856-96
Pipet Tips, for 19700-10 TenSette® Pipet	2	50/pkg	21997-96
Stir Bar, Magnetic	1	each	45315-00
Wipes, Disposable, Kimwipes	1	280/pkg	20970-00

OPTIONAL REAGENTS

Oxygen Demand Standard (BOD, COD, TOC), 10-mL Ampules		16/pkg	28335-10
Potassium Acid Phthalate		500 g	315-34
Sulfuric Acid Reagent Solution, 5.25 N		100 mL MDB	2449-32
TOC Standard Solution Ampules (KHP Standard, 1000 mg/L C)		5/pkg	27915-05
Wastewater Influent Standard, Inorganic (NH_3–N, NO_3–N, PO_4, COD, SO_4, TOC)		500 mL	28331-49

* These items are not sold separately.

OPTIONAL APPARATUS

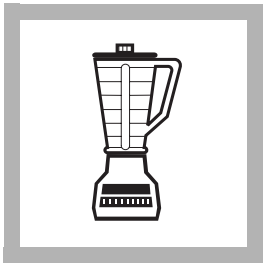
Analytical Balance .....each 28014-01
DRB 200 Reactor, 110 V, 21 x 16 mm and 4 x 20 mm..... LTV082.53.42001
DRB 200 Reactor, 220 V, 21 x 16 mm and 4 x 20 mm..... LTV082.52.42001
DRB 200 Reactor, 110 V, 9 x 16 mm and 2 x 20 mm..... LTV082.53.30001
DRB 200 Reactor, 220 V, 9 x 16 mm and 2 x 20 mm..... LTV082.52.30001
Flask, volumetric, 1000-mL .....each 14574-53
Flask, volumetric, 100-mL .....each 14574-42
Pipet, Class A, 10.00-mL .....each 14515-38
Pipet, Class A, 15.00-mL .....each 14515-39

** This item must be purchased separately.

OXYGEN DEMAND, CHEMICAL

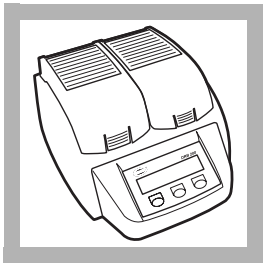
Reactor Digestion Method* USEPA approved for reporting wastewater analysis**

Digestion



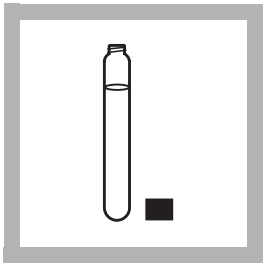
1. 500mL의 샘플을 blender에 넣고 2분간 균질화 시킨다.

Note: For the 0-15,000 mg/L range, *homogenize 100 mL of sample. Pour the blended sample into a 250-mL beaker. Stir with a magnetic stirrer while withdrawing a sample aliquot. This improves accuracy and reproducibility.*



2. DRB200 가열 전처리기를 켜서 150 °C로 예열한다.

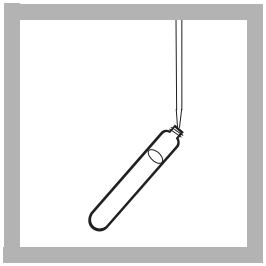
Note: *See DRB 200 user manual for selecting pre-programmed temperature applications.*



3. COD Digestion Reagent Vial을 측정하고자 하는 범위에 맞는 것을 선택해 뚜껑을 연다:

Sample Conc. Range (mg/L)	COD Digestion Reagent Vial Type
0 to 150	Low Range
0 to 1500	High Range
0 to 15,000	High Range Plus

Note: *The reagent mixture is light-sensitive. Keep unused vials in the opaque shipping container, in a refrigerator if possible. The light striking the vials during the test will not affect results.*



4. 바이알을 45도로 기울인다. 피펫으로 샘플을 2mL 담는다.(0 ~ 15,000 mg/L에서는 0.2mL을 담는다.)

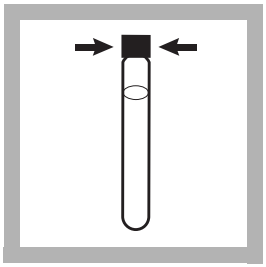
Note: For the 0-15,000 mg/L range, *pipet only 0.20 mL of sample, not 2.00 mL of sample, using a TenSette Pipet. For greater accuracy analyze a minimum of three replicates and average the results.*

Note: *Spilled reagent will affect test accuracy and is hazardous to skin and other materials. Do not run tests with vials which have been spilled. If spills occur, wash with running water.*

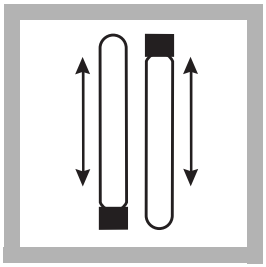
Caution: Some of the chemicals and apparatus used in this procedure may be hazardous to the health and safety of the user if inappropriately or accidentally misused. Please read all warnings and the safety section of this manual. Wear appropriate eye protection and clothing. If contact occurs, flush the affected area with running water. Follow all instructions carefully.

* Jirka, A.M.; Carter, M.J. *Analytical Chemistry*, 1975, 47(8). 1397.

** *Federal Register*, April 21, 1980, 45(78), 26811-26812. The 0-15,000 mg/L range is **not** USEPA approved.

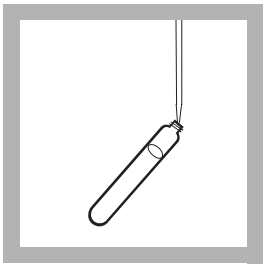


5. 바이알의 뚜껑을 닫고 표면을 증류수로 세척한 후 깨끗이 닦아준다.



6. 바이알의 뚜껑과 바닦 부분을 잡고 부드럽게 수차례 뒤집어서 내용물을 섞어준다. 바이알을 예열된 DRB 200전처리기에 넣는다.

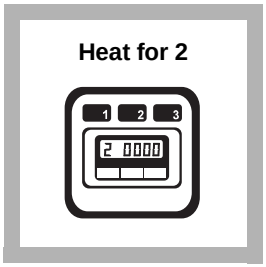
Note: *The vial will become very hot during mixing.*



7. 3~6 과정을 반복해서 blank를 준비한다. 단 샘플이 아닌 증류수를 2mL 담는다.(0 ~ 15,000 mg/L 범위에서는 0.2mL)

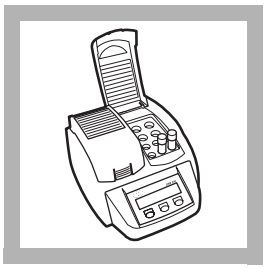
Note: *Be sure the pipet is clean.*

Note: *One blank must be run with each set of samples. Run samples and blanks with vials from the same lot number (lot # is on the container label).*

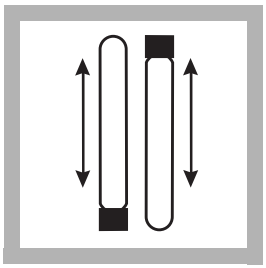


8. 바이알들을 2시간 동안 가열한다.

Note: *Many samples are digested completely in less than two hours. If desired, measure the concentration (while still hot) at 15 minute intervals until the reading remains unchanged. Cool vials to room temperature for final measurement.*



9. 가열 후 전처리기를 끈다. 바이알 온도가 120 °C 이하로 떨어질 때까지 20분정도 기다린다.



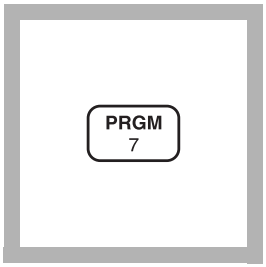
10. 바이알이 아직 따뜻할때 수차례 뒤집어준다. 바이알을 랙에 두고 실온이 될때 까지 공냉시킨다.

Note: *If a pure green color appears in the reacted sample, measure the COD and, if necessary, repeat the test with a diluted sample.*

11. COD 측정을 위해 아래의 분석법 중에 하나를 사용한다:

- Colorimetric method, 0-150 mg/L COD
- Colorimetric method, 0-1,500 mg/L COD
- Colorimetric method, 0-15,000 mg/L COD

Colorimetric Determination, 0 to 150 mg/L COD

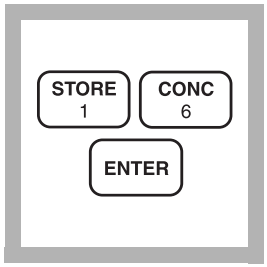


1. chemical oxygen demand (COD), low range 측정을 위해 번호를 선택한다.

Press: **PRGM**

The display will show:

PRGM ?



2. 16번을 선택하고

ENTER. 화면에 **mg/L, COD**와 **ZERO** 아이콘이 표시**.**

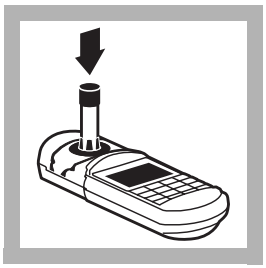
Note: *For alternate form (O_2), press the* **CONC** *key.*

3. COD/TNT 아답타를 셀 홀더에 맞춰 끼운다.

Note: *For increased performance, a diffuser band covers the light path holes on the adapter. Do not remove the diffuser band.*

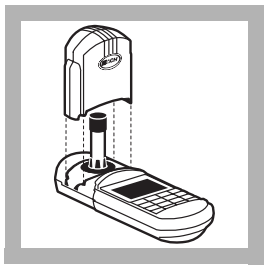
4. blank의 표면을 깨끗이 닦는다.

Note: *Wiping with a damp towel, followed by a dry one, will remove fingerprints or other marks.*



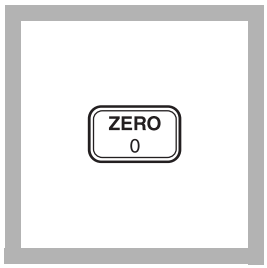
5. blank를 아답타에 맞춰 끼운다.

Note: *Do not move the vial from side to side as this can cause errors.*



6. 기기 덮개를 덮는다.

Note: *The blank is stable when stored in the dark. See Blanks for Colorimetric Determination following these procedures.*

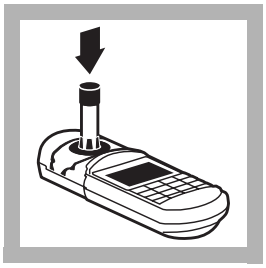


7. ZERO키를 누른다.

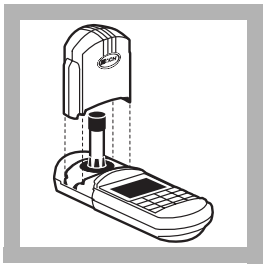
화면에 다음처럼 나타난다:

0 mg/L COD

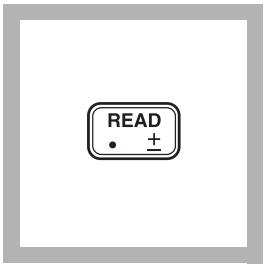
8. 측정할 샘플 바이알을 깨끗이 닦아준다.



9. 샘플 바이알을 아답타에 맞춰 끼운다.



10. 기기 덮개를 덮는다.

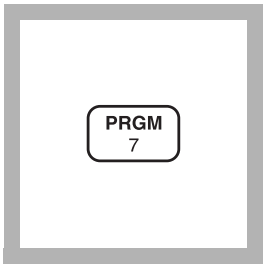


11. READ키를 누른다.

화면에 결과치가 mg/L COD로 나타난다.

Note: *Do not move the vial from side to side as this can cause errors.*

Colorimetric Determination, 0 to 1,500 and 0 to 15,000 mg/L COD

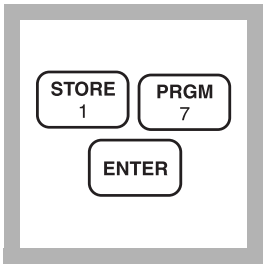


1. chemical oxygen demand, high range 측정을 위해 번호를 선택한다.

Press: **PRGM**

The display will show:

PRGM ?

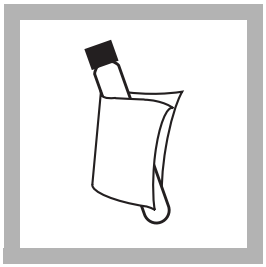


2. 17번을 선택하고

ENTER. 화면에 **mg/L, COD**와 **ZERO** 아이콘이 표시.

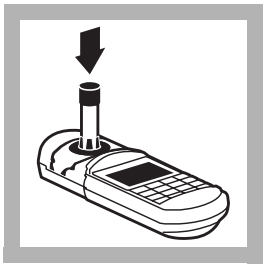
Note: *For alternate form (O_2), press the* **CONC** *key.*

3. COD/TNT 아답타를 셀 홀더에 맞춰 끼운다.



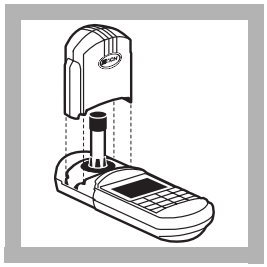
4. blank 바이알의 표면을 깨끗이 닦는다.

Note: *Wiping with a damp towel followed by a dry one will remove fingerprints or other marks.*



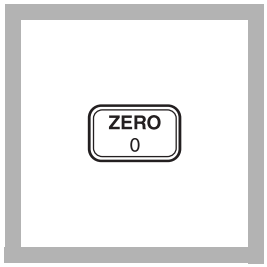
5. blank를 아답타에 맞춰 끼운다.

Note: Do not move the vial from side to side as this can cause errors.



6. 기기 덮개를 덮는다.

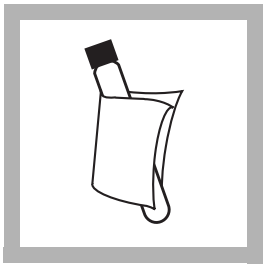
The blank is stable when stored in the dark. See Blanks for Colorimetric Determination following these procedures.



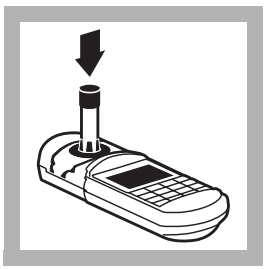
7. **ZERO**키를 누른다.

화면에 다음처럼 나타난다:

0 mg/L COD

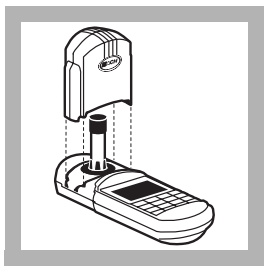


8. 측정할 샘플 바이알의 표면을 깨끗이 닦는다.

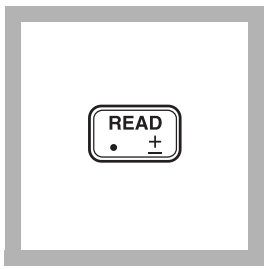


9. 샘플을 아답타에 맞춰 끼운다.

Note: Do not move the vial from side to side as this can cause errors.



10. 기기 덮개를 덮는다.



11. **READ**키를 누른다.

화면에 결과치가 mg/L COD로 나타난다.

Note: When using High Range Plus COD Digestion Reagent Vials, multiply the reading by 10.

Note: For most accurate results with samples near 1,500 or15,000 mg/L COD, repeat the analysis with a diluted sample.

REQUIRED REAGENTS

Description	Qty/Test	Unit	Cat. No.
Select the appropriate COD Digestion Reagent Vial:			
Low Range, 0 to 150 mg/L COD	1 to 2 vials	25/pkg	21258-25
High Range, 0 to 1,500 mg/L COD	1 to 2 vials	25/pkg	21259-25
High Range Plus, 0 to 15,000 mg/L COD	1 to 2 vials	25/pkg	24159-25
Water, deionized	varies	4 L	272-56

REQUIRED APPARATUS

Blender, Osterizer, 120 V, 14 speed	1	each	26160-00
Blender, Osterizer, 240 V, 14 speed	1	each	26160-02
DRB 200 Reactor, 110 V, 15 x 16 mm tubes			LTV082.53.40001
DRB 200 Reactor, 220 V, 15 x 16 mm tubes			LTV082.52.40001
COD/TNT Adapter	1	each	48464-00
Pipet, TenSette, 0.1 to 1.0 mL	1	each	19700-01
Pipet Tips, for 19700-01 TenSette Pipet	1	50/pkg	21856-96
Pipet, volumetric, Class A, 2.00 mL	1	each	14515-36
Pipet Filler, safety bulb	1	each	14651-00
Test Tube Rack	1 to 2 racks	each	18641-00

ALTERNATE REAGENTS*

COD2, LR, 0 to 150 mg/L COD	1–2 vials	25/pkg	25650-25
COD2, HR, 0 to 1500 mg/L COD	1–2 vials	25/pkg	25651-25
COD2, HR, 0 to 1500 mg/L COD	1–2 vials	150/pkg	25651-15
COD2, HR, 0 to 15,000 mg/L COD	1–2 vials	25/pkg	28343-25

OPTIONAL REAGENTS

Description	Unit	Cat. No.
COD Digestion Reagent Vials, 0 to 150 mg/L COD	150/pkg	21258-15
COD Digestion Reagent Vials, 0 to 1,500 mg/L COD	150/pkg	21259-15
COD Standard Solution, 300 mg/L	200 mL	12186-29
COD Standard Solution, 1000 mg/L	200 mL	22539-29
Mercuric Sulfate	28.3 grams	1915-20
Oxygen Demand Standard (BOD, COD, TOC), 10-mL Ampules	16/pkg	28335-10
Potassium Acid Phthalate, ACS	500 g	315-34
Potassium Dichromate Standard Solution, 0.25 N	1000 mL*	1809-53
Sulfuric Acid, ACS	500 mL**	979-49
Wastewater Effluent Standard, Inorganic (NH_3–N, NO_3–N, PO_4, COD, SO_4, TOC)	500 mL	28332-49
Wastewater Influent Standard, Inorganic (NH_3–N, NO_3–N, PO_4, COD, SO_4, TOC)	500 mL	28331-49

OPTIONAL APPARATUS

Balance, analytical, 115 V	each	28014-01
Balance, analytical, 230 V	each	28014-02
Beaker, 250 mL	each	500-46H
Cylinder, graduated, 5 mL	each	508-37
DRB 200 Reactor, 110 V, 21 x 16 mm and 4 x 20 mm		LTV082.53.42001
DRB 200 Reactor, 220 V, 21 x 16 mm and 4 x 20 mm		LTV082.52.42001
DRB 200 Reactor, 110 V, 9 x 16 mm and 2 x 20 mm		LTV082.53.30001
DRB 200 Reactor, 220 V, 9 x 16 mm and 2 x 20 mm		LTV082.52.30001
Electromagnetic Stirrer, 120 V, with electrode stand	each	45300-01
Electromagnetic Stirrer, 230 V, with electrode stand	each	45300-02
Flask, volumetric, Class A, 1000 mL	each	14574-53
Flask, volumetric, Class A, 100 mL	each	14574-42
pH Paper, 1 to 11 pH units	5 rolls/pkg	391-33
Pipet, serological, 5 mL	each	532-37
Pipet Tips, for 19700-01 TenSette Pipet	1000/pkg	21856-28
Pipet, volumetric, Class A, 10 mL	each	14515-38
Spoon, measuring, 0.5 g	each	907-00
Stir Bar, 22.2 x 4.76 mm (7/8" x 3/16")	each	45315-00
Stir Bar Retriever	each	15232-00
Timer	each	26304-00

For Technical Assistance, Price and Ordering

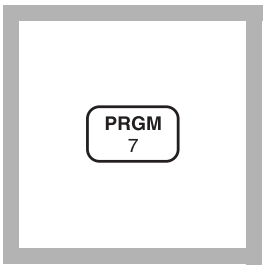
In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

OXYGEN, DISSOLVED, High Range (0 to 15.0 mg/L O_2)

HRDO Method

For water and wastewater

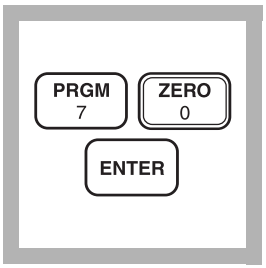


1. dissolved oxygen, high range 측정을 위해 번호를 선택한다.

Press: **PRGM**

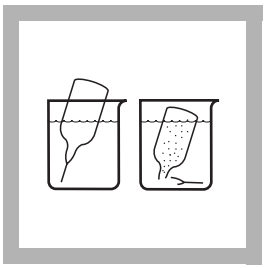
The display will show:

PRGM ?



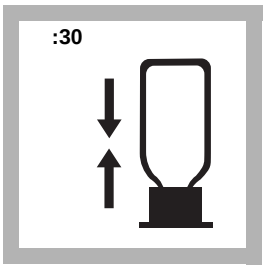
2. 70번을 선택하고 **ENTER.** 화면에 **mg/L, O2**와 **ZERO** 아이콘이 표시.

3. 샘플셀에 샘플을 10mL이상 채운다.(the blank) 푸른색 앰플 뚜껑에 샘플을 채운다. 비커에 샘플을 40mL 이상 채운다.



4. High Range Dissolved Oxygen AccuVac Ampul에 샘플을 채운다.

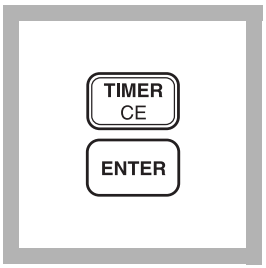
Note: *Keep the tip immersed while the ampul fills completely.*



5. 엠퓰을 뒤집지 않고, 바로 엠퓰 뚜껑을 씌운다. 앰퓰을 30초간 흔들어준다.

Note: *Accuracy is not affected by undissolved powder.*

Note: *The cap prevents contamination with atmospheric oxygen.*

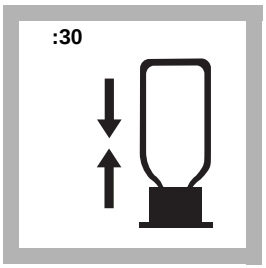


6. 다음 버튼을 누른다:

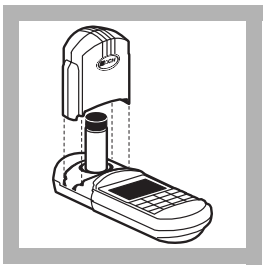
TIMER ENTER

2분간의 반응시간이 표시된다.

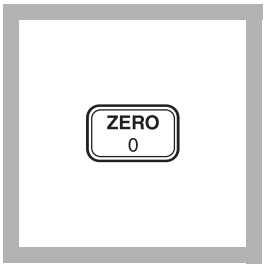
Note: *The two-minute period allows oxygen which was degassed during aspiration to redissolve in the sample and react.*



7. 타이머가 울린 후 앰퓰을 30초간 흔들어 준다.



8. blank를 셀 홀더에 넣고 기기 덮개를 덮는다.

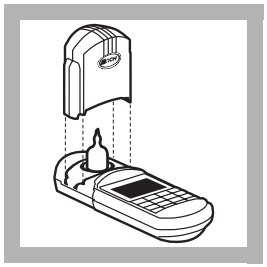


9. ZERO키를 누른다.

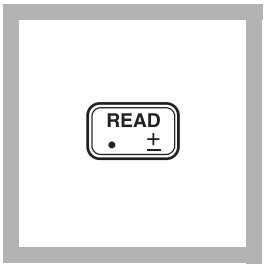
화면에 다음 처럼 나타난다:

0.0 mg/L O2

Note: *If Reagent Blank Correction is on, the display may flash "limit". See Section 1.*



10. 앰퓰을 셀 홀더에 넣고 기기 덮개를 덮는다. 약 30초 정도 기다려서 공기방울을 빛이 투과하는 쪽에서 없어지게 한다.



11. READ키를 누른다.

화면에 결과치가 mg/L O_2로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Section 1).*

REQUIRED REAGENTS

Description	Quantity Required Per Test	Unit	Cat. No.
High Range Dissolved Oxygen AccuVac Ampuls, with 2 reusable ampul caps	1 ampul	25/pkg	25150-25

REQUIRED APPARATUS

Beaker, 50 mL	1	each	500-41H
Caps, ampul, blue	varies	25/pkg	1731-25
Sample Cell, 10-20-25 mL, w/ cap	1	6/pkg	24019-06

OPTIONAL REAGENTS AND APPARATUS

AccuVac Dissolved Oxygen Sampler	each	24051-00
AccuVac Snapper Kit	each	24052-00
AccuVac Drainer	each	41036-00
BOD bottle and stopper, 300 mL	each	621-00
Dissolved Oxygen Meter, Portable HQ 10	each	51815-01
Dissolved Oxygen Reagent Set (Buret Method)	100 tests	23514-00
Dissolved Oxygen Reagent Set (Digital Titrator Method)	50 tests	22722-00

Dissolved oxygen may also be determined by titrimetric methods. Request Publication 8042 for additional information.

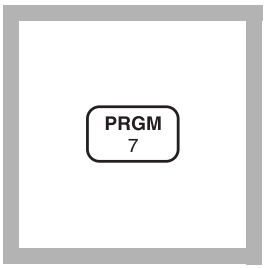
For Technical Assistance, Price and Ordering

In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

OXYGEN, DISSOLVED, Low Range (0 to 1000 µg/L O_2) For boiler feedwater

Indigo Carmine Method (Using AccuVac Ampuls)



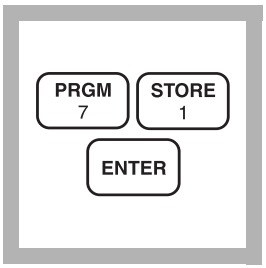
1. low range dissolved oxygen 측정을 위해 번호를 선택한다. (O_2)

Press: **PRGM**

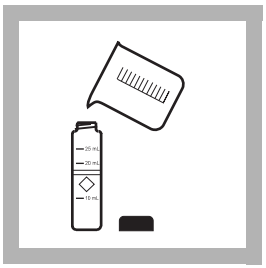
The display will show:

PRGM ?

Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*

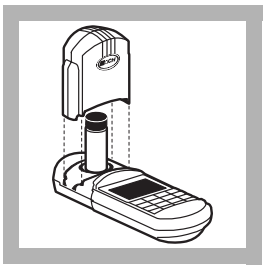


2. 71번을 선택하고 **ENTER.** 화면에 **µg/L, O2**와 **ZERO** 아이콘이 표시.

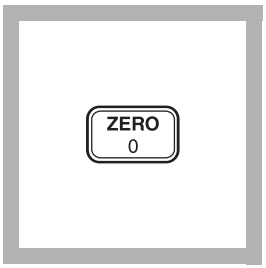


3. 샘플셀에 샘플을 10mL 이상 채운다. (the blank)

Note: *Samples must be analyzed immediately and cannot be stored.*



4. blank를 셀 홀더에 넣고 기기 덮개를 덮는다.

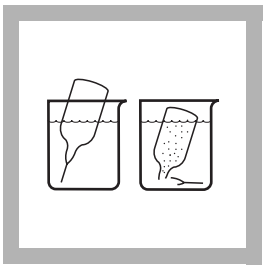


5. ZERO키를 누른다.

화면에 다음처럼 나타난다:

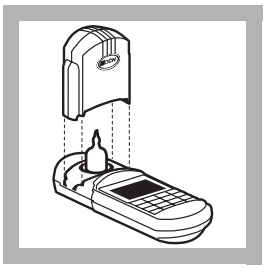
0 µg/L O2

Note: *If Reagent Blank Correction is on, the display may flash "limit". See Section 1.*



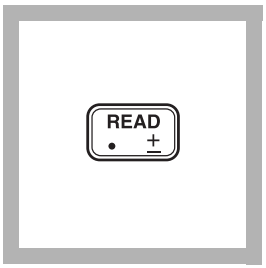
6. 비커에 샘플을 40mL 이상 채운다. Low Range Dissolved Oxygen AccuVac에 샘플을 채운다.

Note: *Keep the tip immersed while the ampul fills completely.*



7. 즉시 앰퓰을 셀 홀더에 넣고 기기 덮개를 덮는다.

Note: *The ampuls will contain a small piece of wire to maintain reagent quality. The solution color will be yellow.*



8. READ키를 누른다.

화면에 결과치가 µg/L dissolved oxygen 으로 나타난다.

Note: *Use the initial reading. The reading is stable for 30 seconds. After 30 seconds, the ampul solution will absorb oxygen from the air.*

REQUIRED REAGENTS & APPARATUS

Description	Quantity Required Per Test	Unit	Cat. No.
Low Range Dissolved Oxygen AccuVac Ampuls	1 ampul	25/pkg	25010-25
Beaker, 50 mL	1	each	500-41H
Sample Cell, 10-20-25 mL, w/cap	1	6/pkg	24019-06

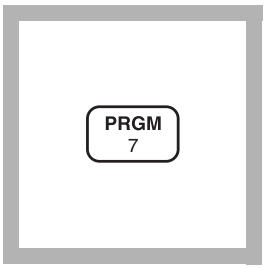
OPTIONAL REAGENTS AND APPARATUS

AccuVac Snapper Kit		each	24052-00
Sodium Hydrosulfite, technical grade		500 g	294-34

For Technical Assistance, Price and Ordering

In the U.S.A.—Call 800-227-4224
Outside the U.S.A.—Contact the Hach office or distributor serving you.

Indigo Method (Using AccuVac Ampuls)

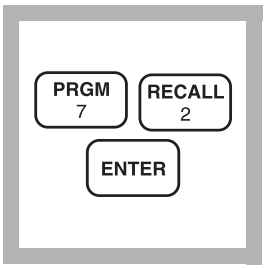


1. stored program에서 AccuVac ampuls 방식 Ozone (O_3) 측정번호를 선택한다.

Press: **PRGM**

The display will show:

PRGM ?

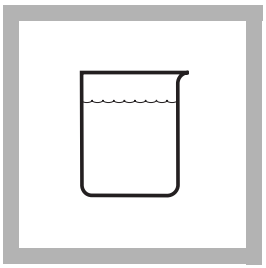


2. 72번 항목 선택시 low range ozone

73번 항목 선택시 mid range ozone

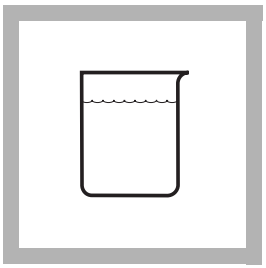
74번 항목 선택시 high range ozone.

ENTER 입력. 화면에 **mg/L, O3**와 **ZERO** 아이콘이 표시.



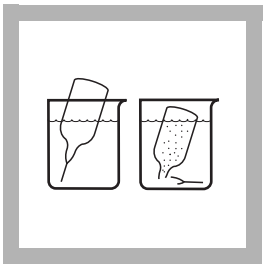
3. 비커에 샘플을 조심스럽게 40mL이상 채운다.

Note: *Samples must be analyzed immediately and cannot be preserved for later analysis. See* Sampling and Storage *following these steps for proper collection.*



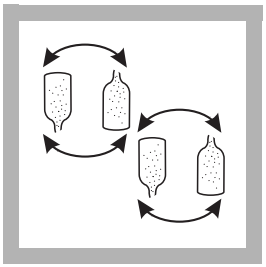
4. 다른 비커에 증류수를 40mL 이상 채운다. (blank)

Note: *Ozone-free water used for the blank may be deionized water or tap water.*



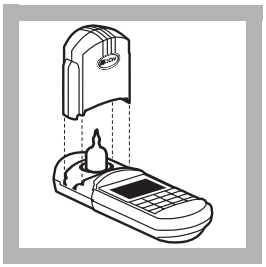
5. Indigo Ozone Reagent AccuVac Ampul 두개에 각각 샘플과 blank를 채운다.

Note: *Keep the tip immersed while the ampul fills.*



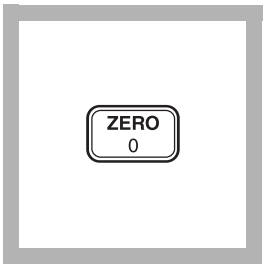
6. 빠르게 앰퓰들을 여러번 뒤집어서 섞어준다. 앰퓰 표면을 깨끗하게 닦아준다.

Note: *Part of the blue color will be bleached if ozone is present. (The sample will be lighter than the blank.)*



7. sample이 들어 있는 엠플을 셀 홀더에 넣고 기기 덮개를 덮어준다.

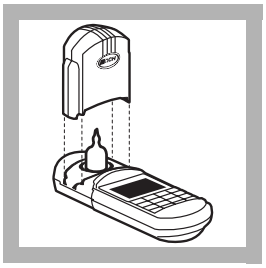
Note: *Standardization for this procedure is intentionally reversed.*



8. ZERO키를 누른다.

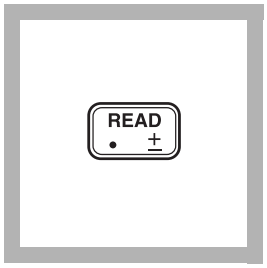
화면에 다음처럼 나타난다:

0.00 mg/L O3



9. blank가 들어있는 엠플을 셀 홀더에 넣고 기기 덮개를 덮는다.

Note: *Standardization for this procedure is intentionally reversed.*



10. READ키를 누른다.

화면에 결과치가 mg/L ozone으로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Section 1).*

REQUIRED REAGENTS

Description	Quantity Required Per Test	Unit	Cat. No.
Ozone AccuVac Ampuls			
Select one or more based on range:			
0-0.25 mg/L	2 ampuls	25/pkg	25160-25
0-0.75 mg/L	2 ampuls	25/pkg	25170-25
0-1.50 mg/L	2 ampuls	25/pkg	25180-25
Water, deionized	varies	4 L	272-56

REQUIRED APPARATUS

Beaker, 50 mL	2	each	500-41H

OPTIONAL APPARATUS

AccuVac Snapper Kit	each	24052-00
AccuVac Ampule sampler	each	24051-00

For Technical Assistance, Price and Ordering

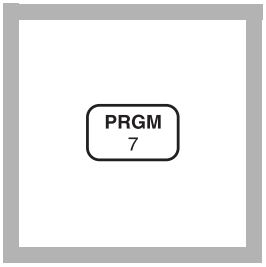
In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

pH (6.5 to 8.5 pH units)

Colorimetric pH Determination Using Phenol Red

For water and wastewater

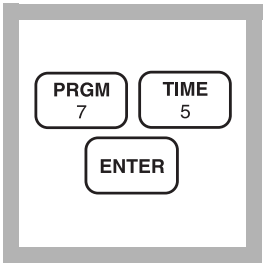


1. pH method 측정을 위해 번호를 선택한다.

Press: **PRGM**

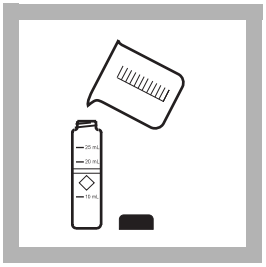
The display will show:

PRGM ?

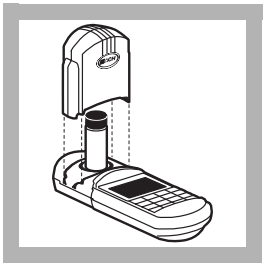


2. 75번을 선택하고

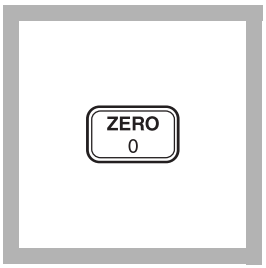
ENTER. 화면에 **PH**와 **ZERO** 아이콘이 표시.



3. 샘플셀에 샘플을 10mL 채운다. (the blank)



4. blank를 셀 홀더에 넣고 기기 덮개를 덮는다.



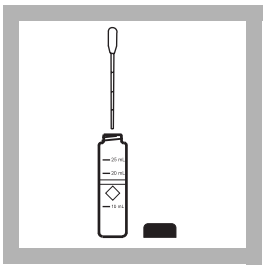
5. ZERO키를 누른다.

화면에 다음처럼 나타난다:

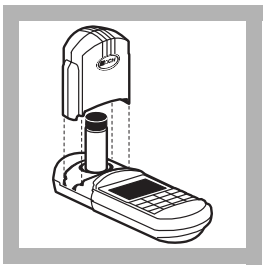
6.0 PH

6. 다른 샘플셀에 샘플 10mL을 채운다.

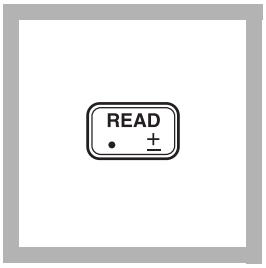
Note: *Sample temperature must be 21-29 °C.*



7. 1회용 스포이드 등으로 1mL의 Phenol Red Indicator Solution을 셀에 첨가한다. (the prepared sample). 뚜껑을 닫고 두번 뒤집어서 섞어준다.



8. 혼합된 셀을 셀 홀더에 넣고 기기 덮개를 덮는다.



9. READ키를 누른다.

화면에 결과치가
pH 단위로 나타난다.

Note: *Use of the Standard Adjust feature is highly recommended. See* Accuracy Check.

Note: *Any reading below 6.5 pH units will be erroneous.*

REQUIRED REAGENTS & APPARATUS

Description	Quantity Required Per Test	Units	Cat. No.
Dropper, 0.5 & 1.0 mL marks	1	20/pkg	21247-20
Phenol Red Indicator Solution, spec grade	1.0 mL	50 mL	26575-12
Sample Cells, 10-20-25 mL, w/ cap	2	6/pkg	24019-06

OPTIONAL REAGENTS

pH 7.0 Buffer Solution		500 mL	12222-49

OPTIONAL APPARATUS

Description	Units	Cat. No.
Thermometer, -20 to 110 °C, Non-Mercury	each	26357-02

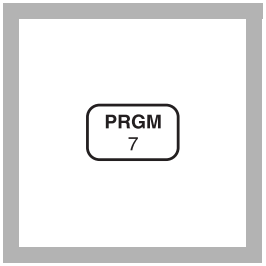
For Technical Assistance, Price and Ordering

In the U.S.A. call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

PHOSPHONATES (0-2.5 to 0-125 mg/L)

Persulfate UV Oxidation Method*



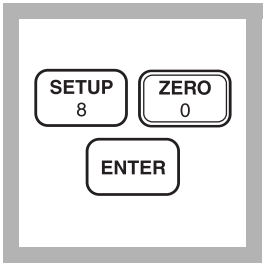
1. phosphonates 측정을 위해 번호를 선택한다.

Press: **PRGM**

The display will show:

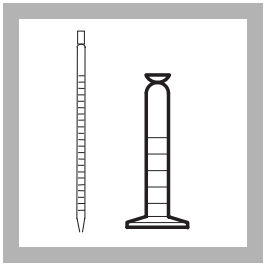
PRGM ?

Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*



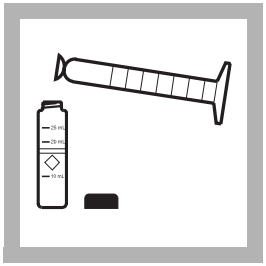
2. 80번을 선택하고

ENTER. 화면에 **mg/L, PO4**와 **ZERO** 아이콘이 표시**.**



3. 아래쪽의 Table 1을 참조해서 적절한 샘플의 양을 선택한다. 피펫으로 선택한 샘플의 양을 50mL 눈금 실린더에 담는다. 샘플을 50mL까지 증류수로 희석한다. 잘 섞어 주도록한다.

Note: *Clean glassware with 1:1 hydrochloric acid, followed by a deionized water rinse. Do not use commercial detergents containing phosphates to clean glassware.*

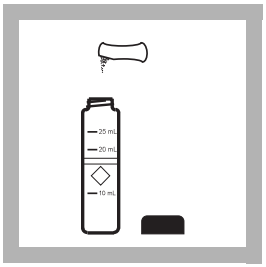


4. 희석시킨 샘플을 샘플셀에 10mL 담는다. (**blank**로 표시) 다른 샘플셀에 25mL을 담는다.(Sample로 표시)

Table 1

Expected Range (mg/L phosphonate)	Sample Volume (mL)
0-2.5	50
0-5	25
0-12.5	10
0-25	5
0-125	1

* Adapted from Blystone, P.; Larson, P., *A Rapid Method for Analysis of Phosphonate Compounds*, International Water Conference, Pittsburgh, Pa. (Oct. 26-28, 1981).



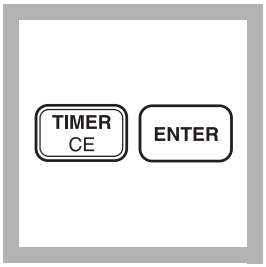
5. Potassium Persulfate Phosphonate Powder Pillow를 sample로 표시한 셀에 첨가하고 휘저어 섞어준다.

6. UV 램프를 sample로 표시한 셀에 넣는다.

Note: *Wear UV safety goggles while the lamp is on.*

Note: *Do not handle the lamp surface. Fingerprints will etch the glass. Wipe lamp with a soft, clean tissue between samples. Do not use detergents with phosphates to wash glassware.*

Note: *A specially designed cord adapter is available for performing two digestions with a single power supply. A second UV lamp is required.*



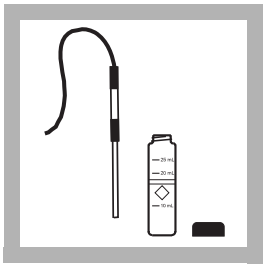
7. UV 램프를 켜서 sample을 증해 시킨다.

TIMER ENTER 입력.

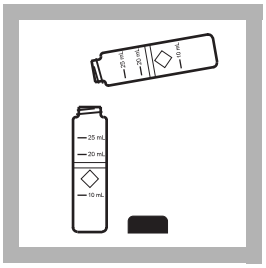
10분간의 반응시간이 표시된다.

Note: *Phosphonates are converted to ortho-phosphate in this step.*

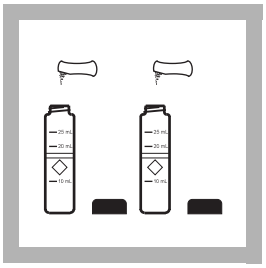
Note: *The digestion step may take less time. Contaminated samples or a weak lamp could result in incomplete digestion. Check efficiency by running a longer digestion to see if readings increase.*



8. 타이머가 울린 후, UV램프를 끄고 셀에서 꺼낸다.

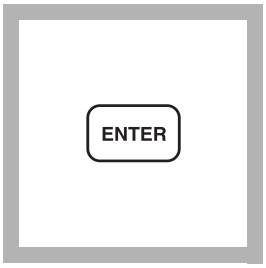


9. "sample"로 표시한 셀에서 깨끗한 다른 샘플셀로 내용물을 10mL 옮겨 담는다. (the prepared sample)



10. PhosVer 3 Phosphate Reagent Powder Pillow를 각 셀에 첨가하고 바로 휘저어 섞어준다.

Note: *A blue color will form if phosphate is present. Sample and blank cells may develop color.*

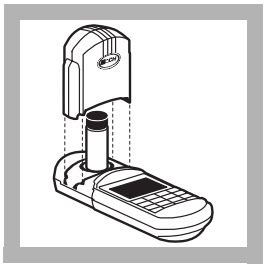


11. 화면에 다음처럼 표시: **2:00 TIMER 2**

ENTER키를 누른다.

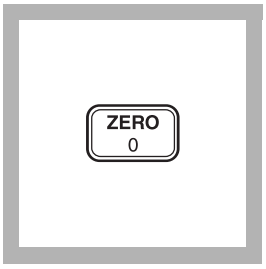
2분간의 반응시간이 표시된다.

Note: *If sample is colder than 15 °C, 4 minutes are required for color development.*



12. 타이머가 울린 후, blank를 셀 홀더에 넣고 기기 덮개를 덮는다.

Note: *Perform Steps 12-15 within three minutes after the timer beeps.*

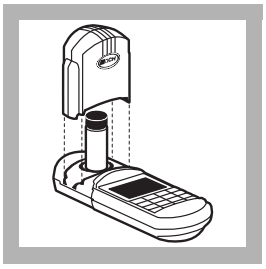


13. ZERO키를 누른다.

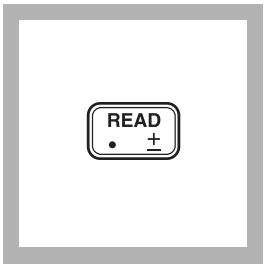
화면에 다음처럼 나타난다:

0.0 mg/L PO4

Note: *If Reagent Blank Correction is on, the display may flash "limit". See Section 1.*



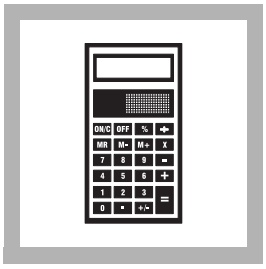
14. 측정할 샘플을 셀 홀더에 넣고 기기 덮개를 덮는다.



15. READ키를 누른다.

화면에 결과치가 mg/L phosphate로 표시된다. 샘플 속의 실제 phosphate 농도를 구하기 위해서 아래의 Table 2를 보고 알맞은 곱셈식을 찾아서 이 결과치에 곱해준다.

Note: *Standard Adjust may be performed using a prepared standard (see Standard Adjust in Section 1).*



16. 결과물을 아래 Table 3 에서 제시된 공식 및 적절한 변환식을 사용하여 특정한 활성 phosphate로 표시할 수 있다.

REQUIRED REAGENTS

Phosphonates Reagent Set (100 tests) 24297-00
Includes: (2) 21060-69, (1) 20847-69

Description	Quantity Required Per Test	Unit	Cat. No
PhosVer 3 Phosphate Reagent Powder Pillows	2 pillows	100/pkg	21060-69
Potassium Persulfate Pillow for Phosphonate	1 pillow	100/pkg	20847-69
Water, deionized	varies	4 L	272-56

REQUIRED APPARATUS

Cylinder, mixing, graduated, 50 mL	1	each	1896-41
Goggles, UV safety	1	each	21134-00
Pipet, serological, 25 mL	1	each	2066-40
Pipet Filler, safety bulb	1	each	14651-00
Sample Cell, 10-20-25 mL, w/cap	2	6/pkg	24019-06
UV Lamp with power supply, 115 V, with goggles	1	each	20828-00
OR			
UV Lamp with power supply, 230 V	1	each	20828-02

OPTIONAL REAGENTS

Hydrochloric Acid, 6.0 N (1:1)	500 mL	884-49
Sulfuric Acid, ACS	500 mL	979-49

OPTIONAL APPARATUS

pH Paper, 1 to 11 pH units	5 rolls/pkg		391-33
Pipet, serological, 2 mL		each	532-36
Pipet, TenSette, 1-10 mL		each	19700-10
Pipet Tips, for 19700-10 Tensette Pipet	50/pkg		21997-96
Thermometer, -20 to 110 °C, Non-Mercury		each	1877-01

For Technical Assistance, Price and Ordering

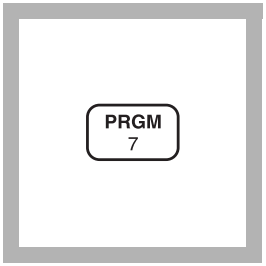
In the U.S.A. call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

PHOSPHORUS, REACTIVE (0 to 45.0 mg/L PO_4^{3-}) For water and wastewater

(Also called Orthophosphate) Molybdovanadate Method*
(Reagent Solution or AccuVac Ampuls)

Using Reagent Solution

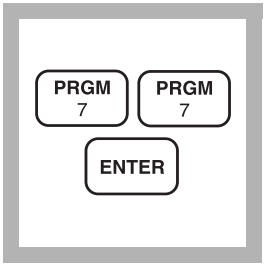


1. high range phosphate 의 reagent solution 방식 측정번호를 선택한다.

Press: **PRGM**

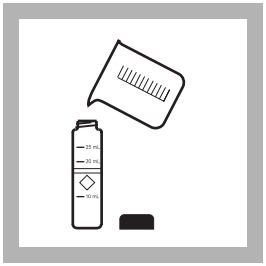
The display will show:

PRGM ?

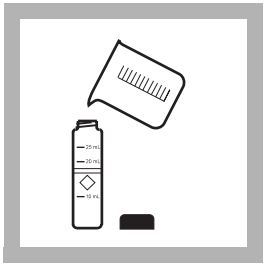


2. 77번을 선택하고 **ENTER.** 화면에 **mg/L, PO4**와 **ZERO** 아이콘이 표시.

Note: *For alternate forms (P, P_2O_5), press the* **CONC** *key.*

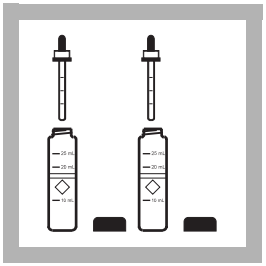


3. 샘플셀에 증류수를 25mL 채운다. (the blank)



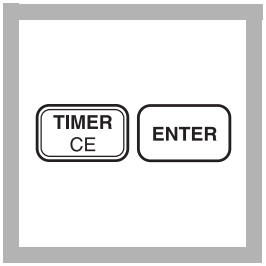
4. 다른 샘플셀에 샘플을 25mL 채운다. (the prepared sample)

Note: *For best results, the sample temperature should be 20-25 °C.*



5. Molybdovanadate Reagent 1.0mL을 각 셀에 첨가하고 뚜껑을 닫은 후, 뒤집어서 섞어준다.

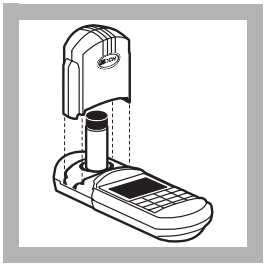
Note: *A yellow color will form if phosphate is present. A small amount of yellow will be present in the blank, because of the reagent.*



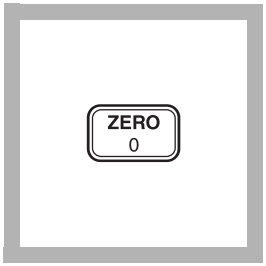
6. 다음 버튼을 누른다:

TIMER ENTER

5분간의 반응시간이 나타난다.



7. 타이머가 울린 후, blank를 셀 홀더에 넣고 기기 덮개를 덮는다.



8. **ZERO**키를 누른다.

화면에 다음처럼 나타난다:

0.0 mg/L PO4

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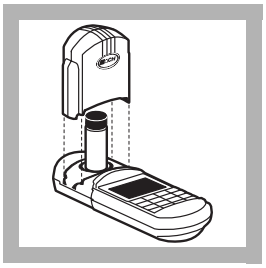
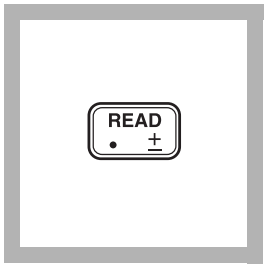
* Adapted from *Standard Methods for the Examination of Water and Wastewater.*



9. 측정할 샘플을 셀 홀더에 넣고 기기 덮개를 덮는다.

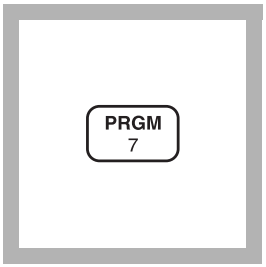


10. READ키를 누른다.

화면에 결과치가 mg/L phosphate (또는 선택한 단위)로 나타난다.

Note: *Use of the Standard Adjust feature with each new lot of reagent is highly recommended. See Accuracy Check.*

Using AccuVac Ampuls

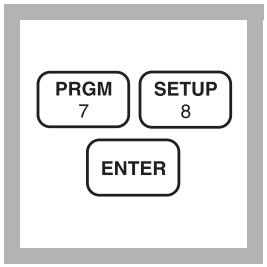


1. high range phosphate 의 AccuVac Ampuls 방식 측정번호를 선택한다.

Press: **PRGM**

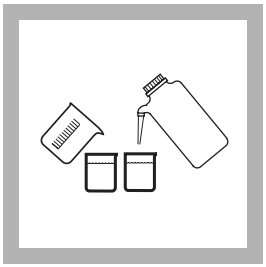
The display will show:

PRGM ?



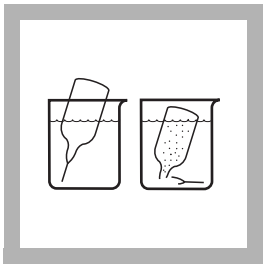
2. 78번을 선택하고 **ENTER.** 화면에 **mg/L, PO4**와 **ZERO** 아이콘이 표시.

Note: *For alternate forms (P, P_2O_5), press the* **CONC** *key.*



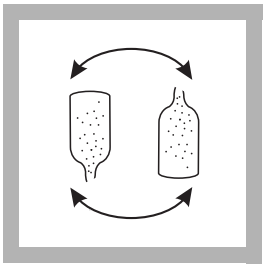
3. 비커 두개에 각각 샘플과 증류수를 40mL 씩 채운다.

Note: *For best results, sample temperature should be 20-25 °C.*



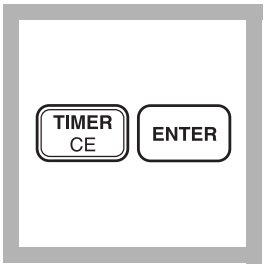
4. Molybdovanadate Reagent AccuVac Ampul 두개에 각각 준비한 샘플과 증류수를 채운다.

Note: *Keep the tip immersed while the ampul fills completely.*



5. 엠퓰을 수차례 뒤집어서 섞어준다. 엠퓰의 표면을 깨끗이 닦아 준다.

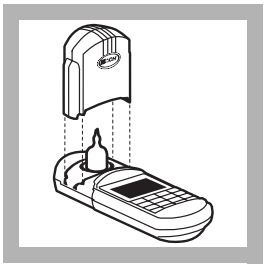
Note: *A yellow color will form if phosphate is present. A small amount of yellow will be present in the blank because of the reagent.*



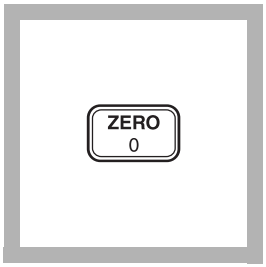
6. 다음 버튼을 누른다:

TIMER ENTER

5분간의 반응시간이 표시된다.



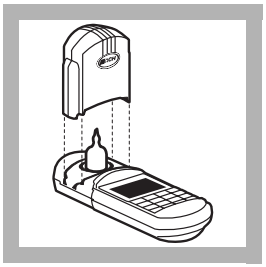
7. 타이머가 울린 후, 증류수를 담은 엠퓰을 셀 홀더에 넣고 기기 덮개를 덮는다.



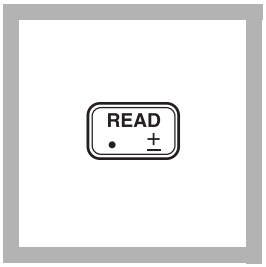
8. **ZERO**키를 누른다.

화면에 다음처럼 나타난다:

0.0 mg/L PO4



9. 샘플을 담은 엠퓰을 셀 홀더에 넣고 기기 덮개를 덮는다.



10. **READ**키를 누른다.

화면에 결과치가 mg/L phosphate (또는 선택한 단위)로 나타난다.

Note: *Use of the Standard Adjust feature with each new lot of reagent is highly recommended. See Accuracy Check.*

REQUIRED REAGENTS AND APPARATUS (using Reagent Solution)

Description	Quantity Required Per Test	Units	Cat. No.
Molybdovanadate Reagent	2.0 mL	100 mL* MDB	20760-32
Sample Cell, 10-20-25 mL, w/ cap	2	6/pkg	24019-06
Water, deionized	25 mL	4 L	272-56

REQUIRED REAGENTS AND APPARATUS (using AccuVac Ampuls)

Molybdovanadate Reagent AccuVac Ampuls	2	25/pkg	25250-25
Beaker, 50 mL	2	each	500-41H
Water, deionized	25 mL	4 L	272-56

OPTIONAL REAGENTS

Description	Units	Cat. No.
Bromine Water, 30 g/L	29 mL*	2211-20
Hydrochloric Acid Solution, 1:1 (6.0 N)	500 mL	884-49
Phenol Solution, 30 g/L	29 mL	2112-20
Phosphate Standard Solution, 10.0 mg/L as PO_4^{3-}	946 mL	14204-16
Phosphate Standard Solution, Voluette Ampule, 500 mg/L as PO_4^{3-}, 10 mL	16/pkg	14242-10
Sodium Hydroxide Standard Solution, 5.0 N	100 mL* MDB	2450-32
Sulfuric Acid, ACS	500 mL*	979-49
Wastewater Influent Standard, Inorganic (NH_3–N, NO_3–N, PO_4, COD, SO_4, TOC)	500 mL	28331-49

OPTIONAL APPARATUS

AccuVac Snapper Kit	each	24052-00
Ampule Breaker Kit	each	21968-00
Cylinder, graduated, 25 mL	each	508-40
Cylinder, graduated, mixing, 25-mL	each	20886-40
Dispenser, fixed volume, 1.0 mL Repipet Jr.	each	21113-02
Flask, erlenmeyer, 50 mL	each	505-41
Flask, volumetric, Class A, 50 mL	each	14574-41
pH Paper, 1 to 11 pH units	5 rolls/pkg	391-33
pH Meter, *Sension™1*, portable with electrode	each	51700-10

* Contact Hach for larger sizes.

OPTIONAL APPARATUS (continued)

Description	Units	Cat. No.
Pipet, serological, 2.0 mL	each	532-36
Pipet, TenSette, 0.1 to 1.0 mL	each	19700-01
Pipet Tips, for 19700-01 TenSette Pipet	50/pkg	21856-96
Pipet Tips, for 19700-01 TenSette Pipet	1000/pkg	21856-28
Thermometer, -20 to 110 °C	each	26357-02

For Technical Assistance, Price and Ordering

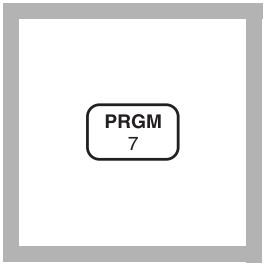
In the U.S.A.—Call 800-227-4224
Outside the U.S.A.—Contact the Hach office or distributor serving you.

PHOSPHORUS, REACTIVE (0 to 2.50 mg/L PO_4^{3-}) For water, wastewater, seawater

(Also called Orthophosphate) PhosVer 3 (Ascorbic Acid) Method*

(Powder Pillows or AccuVac Ampuls) **USEPA Accepted for wastewater analysis reporting****

Using Powder Pillows



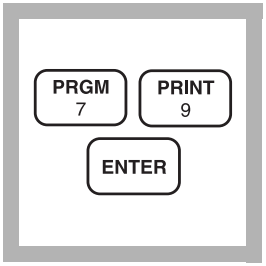
1. reactive phosphorus, ascorbic acid method의 측정을 위해 번호를 선택한다.

Press: **PRGM**

The display will show:

PRGM ?

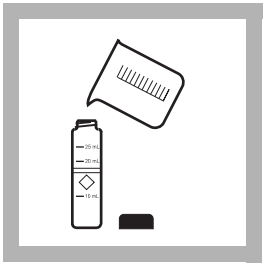
Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*



2. 79번을 선택하고

ENTER. 화면에 **mg/L, PO4**와 **ZERO** 아이콘이 표시.

Note: *For alternate forms (P, P_2O_5), press the* **CONC** *key.*



3. 샘플셀에 샘플을 10mL 담는다.

Note: *For samples with extreme pH, see* Interferences *following these steps.*

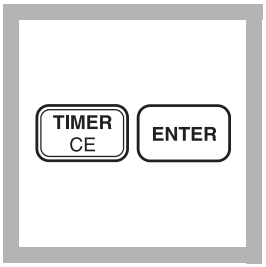
Note: *Clean glassware with 1:1 HCl. Rinse again with deionized water. Do not use detergents containing phosphates to clean glassware.*

4. PhosVer 3 Phosphate Powder Pillow를 샘플셀에 첨가한다 (prepared sample). 셀을 15초간 흔들어 준다.

Note: *A blue color will form if phosphate is present.*

* Adapted from *Standard Methods for the Examination of Water and Wastewater.*

** Procedure is equivalent to USEPA method 365.2 and Standard Method 4500-PE for wastewater.



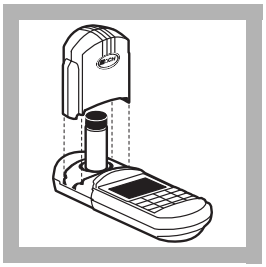
5. 다음 버튼을 누른다:

TIMER ENTER

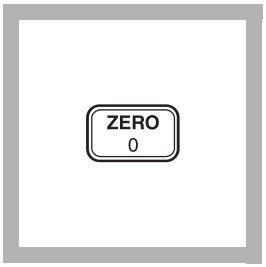
2분간의 반응시간이 시작된다. 반응시간 동안 6~8단계 실험을 진행한다.

Note: *If the acid-persulfate digestion was used, an 8-10 minute reaction period is required.*

6. 다른 샘플셀에 샘플 10mL을 채운다. (the blank)



7. blank를 셀 홀더에 넣고 기기 덮개를 덮는다.

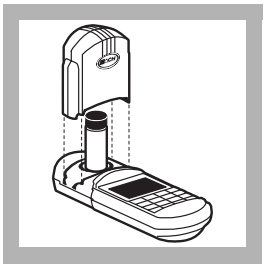


8. **ZERO**키를 누른다.

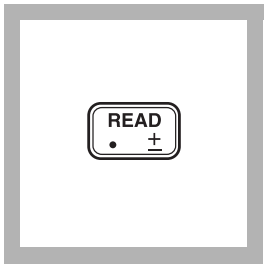
화면에 다음처럼 나타난다:

0.00 mg/L PO4

Note: *If Reagent Blank Correction is on, the display may flash "limit". See Section 1.*



9. 타이머가 울린 후, 측정할 샘플셀을 셀 홀더에 넣고 기기 덮개를 덮는다.

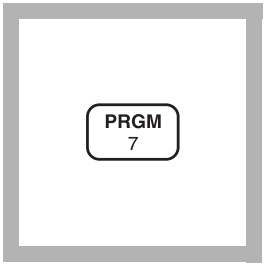


10. **READ**키를 누른다.

화면에 결과치가 mg/L phosphate (PO_4^{3-})로 나타난다.

Note: *Standard Adjust may be performed using a 2.0-mg/L PO_4^{3-} standard; see Section 1.*

Using AccuVac Ampuls



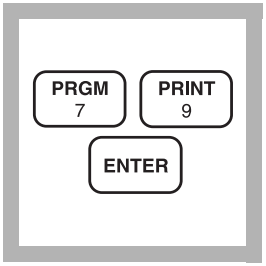
1. reactive phosphorus-ascorbic acid method의 측정을 위해서 번호를 선택한다.

Press: **PRGM**

The display will show:

PRGM ?

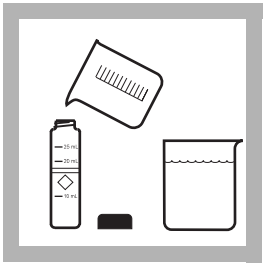
Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*



2. 79번을 선택하고

ENTER. 화면에 **mg/L, PO4**와 **ZERO** 아이콘이 표시된다**.**

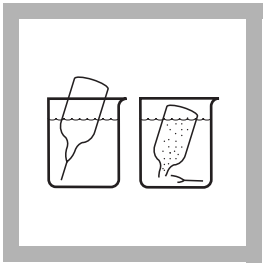
Note: *For alternate forms (P, P_2O_5), press the* **CONC** *key.*



3. 샘플셀에 샘플을 10mL 이상 채운다 (the blank). 비커에 샘플을 40mL 이상 채운다.

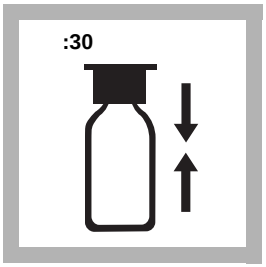
Note: *For samples with extreme pH, see* Interferences.

Note: *Clean glassware with 1:1 HCl. Rinse again with deionized water. Do not use detergent containing phosphates to clean glassware.*



4. PhosVer 3 Phosphate AccuVac Ampul에 샘플을 채운다.

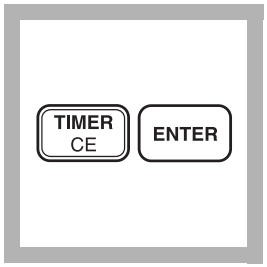
Note: *Keep the tip immersed while the ampul fills completely.*



5. 엠퓰에 마게를 닫고 약 30초간 흔든다. 엠퓰 표면을 깨끗이 닦아준다.

Note: *A blue color will form if phosphate is present.*

Note: *Accuracy is not affected by undissolved powder.*

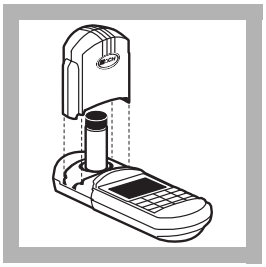


6. 다음 버튼을 누른다:

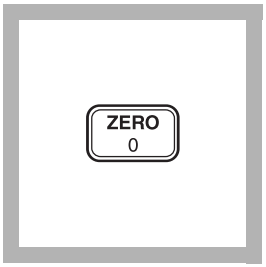
TIMER ENTER

2분간의 반응시간이 시작된다. 그동안 7~8단계의 실험을 진행한다.

Note: *Use an 8-10 minute reaction period if determining total phosphorus following the acid-persulfate digestion.*



7. blank를 셀 홀더에 넣고 기기 덮개를 덮는다.

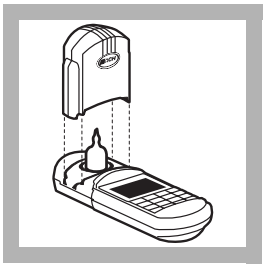


8. ZERO키를 누른다.

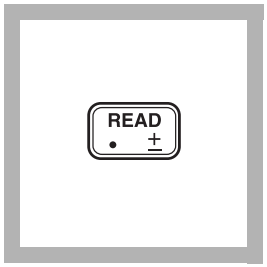
화면에 다음처럼 나타난다:

0.00 mg/L PO4

Note: *If Reagent Blank Correction is on, the display may flash "limit". See Section 1.*



9. 타이머가 울린 후, 엠퓰을 셀 홀더에 넣고 기기 덮개를 덮는다.



10. READ키를 누른다.

화면에 결과치가 mg/L phosphate (PO_4^{3-})로 나타난다.

Note: *Standard Adjust may be performed using a 2.0-mg/L PO_4^{3-} standard; see Section 1.*

REQUIRED REAGENTS & APPARATUS (Using Powder Pillows)

Description	Quantity Required Per Test	Unit	Cat. No.
PhosVer 3 Phosphate Reagent Powder Pillows 10 mL sample size	1 Pillow	100/pkg	21060-69
Sample Cell, 10-20-25 mL, w/cap	2	6/pkg	24019-06

REQUIRED REAGENTS & APPARATUS (Using AccuVac Ampuls)

PhosVer 3 Phosphate Reagent AccuVac Ampuls	1 ampul	25/pkg	25080-25
Beaker, 50 mL	1	each	500-41
Cap, ampul, blue	1	25/pkg	1731-25
Sample Cell, 10-20-25 mL, w/cap	1	6/pkg	24019-06

OPTIONAL REAGENTS

Drinking Water Standard, Inorganic, F^-, NO_3^{-N}, PO_4^{3-}, SO_4^{2-}		500mL	28330-49
Hydrochloric Acid Standard Solution, 6.0 N (1:1)		500 mL	884-49
Phosphate Standard Solution, 1mg/L		500mL	2569-49
Phosphate Standard Solution, PourRite ampule, 50 mg/L as PO_4^{3-}, 2 mL		20/pkg	171-20
Phosphate Standard Solution, Voluette Ampul, 50 mg/L, 10 mL		16/pkg	171-10
Sodium Hydroxide Standard Solution, 5.0 N		100 mL* MDB	2450-32
Wastewater Effluent Standard, Inorganic (NH_3–N, NO_3–N, PO_4, COD, SO_4, TOC)		500 mL	28332-49
Water, deionized		4 L	272-56

OPTIONAL APPARATUS

AccuVac Snapper Kit		each	24052-00
Ampule Breaker Kit for 10-ml ampules		each	21968-00
Aspirator, vacuum		each	2131-00
Cylinder, graduated, mixing, 25 mL, tall (3 required)		each	20886-40
Filter Holder, 47 mm, 300 mL, graduated		each	13529-00
Filter, membrane, 47 mm, 0.45 microns		100/pkg	13530-00
Flask, filtering, 500 mL		each	546-49
Flask, volumetric, Class A, 100 mL		each	14574-42
pH Indicator Paper, 1 to 11 pH		5 rolls/pkg	391-33
pH Meter, *Sension™1*, portable with electrode		each	51700-10
Pipet, 2 mL serological		each	532-36
Pipet, TenSette, 0.1 to 1.0 mL TenSette Pipet		each	19700-01
Pipet Tips, for 19700-01		50/pkg	21856-96
Pipet Tips, for 19700-01		1000/pkg	21856-28
Pipet Filler, safety bulb		each	14651-00
Pipet, volumetric, Class A, 4.00 mL		each	14515-04
PourRite Ampule Breaker Kit		each	24846-00

Outside the U.S.A.—Contact the Hach office or distributor serving you.

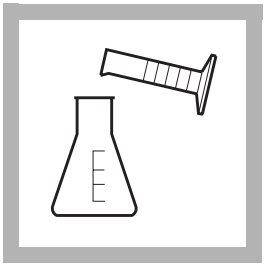
* Larger sizes available.

PHOSPHORUS, TOTAL

For water, wastewater, and seawater

(Also called Organic and Acid Hydrolyzable) Acid Persulfate Digestion Method*

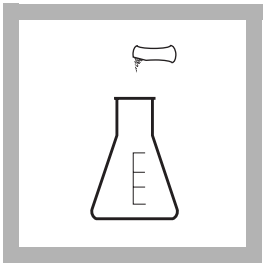
USEPA Accepted for reporting wastewater analysis**



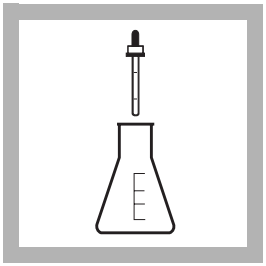
1. 눈금 실린더를 사용해서 샘플 25mL을 50mL erlenmeyer 플라스크에 담는다.

Note: *Rinse all glassware with 1:1 Hydrochloric Acid Solution. Rinse again with deionized water. Do not use detergents containing phosphates to clean glassware.*

Note: *Adjust the pH of stored samples before digestion.*

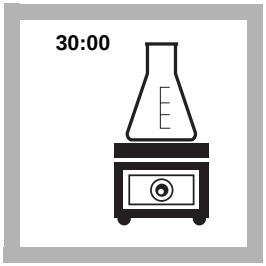


2. Potassium Persulfate Powder Pillow를 하나 첨가하고 휘저어서 섞어준다.



3. 2.0mL의 5.25 N Sulfuric Acid Solution을 첨가한다.

Note: *Use the 1-mL calibrated dropper provided.*



4. 플라스크를 가열기에 올리고 30분간 살짝 끓여준다.

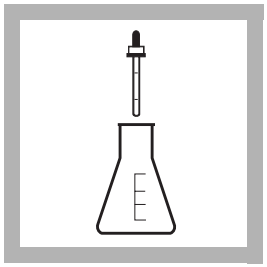
Note: *Samples should be concentrated to less than 20 mL for best recovery. After concentration, maintain the volume near 20 mL by adding small amounts of deionized water. Do not exceed 20 mL.*

---

* Adapted from *Standard Methods for the Examination of Water and Wastewater.*

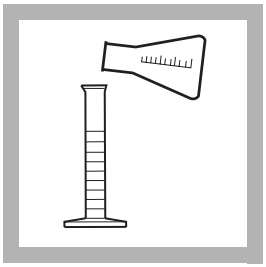
** Procedure is equivalent to USEPA Method 365.2 and Standard Method 4500-P B,5 & P E.

5. 샘플을 실온으로 냉각시킨다.



6. 2mL의 5.0 N Sodium Hydroxide Solution을 첨가하고 섞어준다.

Note: *Use the 1-mL calibrated dropper provided.*



7. 샘플을 25mL 눈금 실린더에 따른다. 양을 다시 25mL로 맞춘다. 반응한 phosphorus로 예상되는 총인농도에 맞춰 실험을 시작한다.

Note: *Use deionized water rinsings from the flask to adjust the volume.*

Note: *Results of the reactive phosphorus test at this point will include the organic phosphate plus the orthophosphate and the acid-hydrolyzable (condensed) phosphate. The organic phosphate concentration is determined by subtracting results of an acid hydrolyzable phosphorus test from this result. Make sure that both results are in the same units before taking the difference.*

REQUIRED REAGENTS

Description	Quantity Required Per Test	Unit	Cat. No.
Potassium Persulfate Powder Pillows	1 pillow	100/pkg	2451-99
Sodium Hydroxide Solution, 5.0 N	2 mL	100 mL* MDB	2450-32
Sulfuric Acid Solution, 5.25 N	2 mL	100 mL* MDB	2449-32

REQUIRED APPARATUS

Cylinder, graduated, 25 mL	2	each	508-40
Flask, erlenmeyer, 50 mL	1	each	505-41
Sample Cell, 10-20-25 mL, w/caps	2	6/pkg	24019-06

OPTIONAL REAGENTS

Drinking Water Standard, Inorganic, F^-, $NO_3^{-N,}$ PO_4^{3-}, SO_4^{2-}		500mL	28330-49
Hydrochloric Acid, 6 N		500 mL	884-49
Sodium Hydroxide Solution, 5.0 N		1 L	2450-53
Sulfuric Acid		500 mL	979-49
Wastewater Effluent Standard, Inorganic (NH_3–N, NO_3–N, PO_4, COD, SO_4, TOC)		500 mL	28332-49
Wastewater Influent Standard, Inorganic (NH_3–N, NO_3–N, PO_4, COD, SO_4, TOC)		500 mL	28331-49
Water, deionized		4 L	272-56

OPTIONAL APPARATUS

Description	Unit	Cat. No.
Cylinder, graduated, 50 mL	each	508-41
Flask, erlenmeyer, 125 mL	each	505-43
Hot Plate, 4" diameter, 120 Vac	each	12067-01
Hot Plate, 4" diameter, 240 Vac	each	12067-02
Pads, cooling, 4 x 4"	each	18376-00
pH Indicator Paper, 1 to 11 pH	5 rolls/pkg	391-33
pH Meter, *Sension™1*, portable with electrode	each	51700-10

For Technical Assistance, Price and Ordering

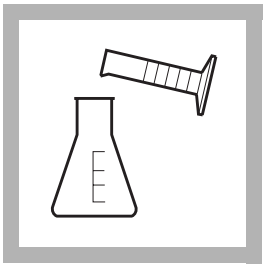
In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

PHOSPHORUS, ACID HYDROLYZABLE

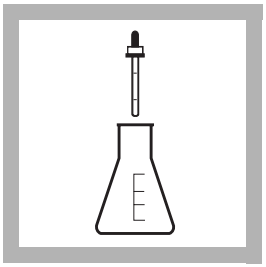
Hydrolysis to Orthophosphate Method*

For water, wastewater, seawater



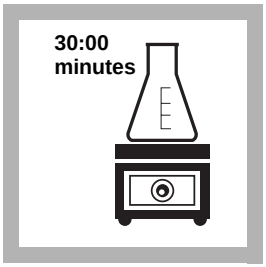
1. 눈금 실린더를 사용해서 샘플 25mL을 50mL erlenmeyer 플라스크에 담는다.

Note: *Wash all glassware with 6 N hydrochloric acid. Rinse with deionized water. Do not use detergents containing phosphate to clean glassware.*



2. 2.0mL의 5.25 N Sulfuric Acid Solution을 첨가한다.

Note: *Use the 1-mL calibrated dropper provided.*

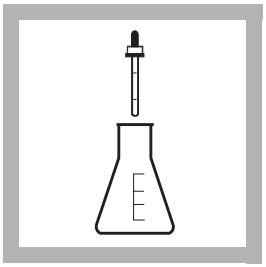


3. 플라스크(the prepared sample)를 가열기에 올리고 30분간 살짝 끓인다.

Note: *Samples should be concentrated to less than 20 mL for best recovery. After concentration, maintain the volume near 20 mL by adding small amounts of deionized water. Do not exceed 20 mL.*

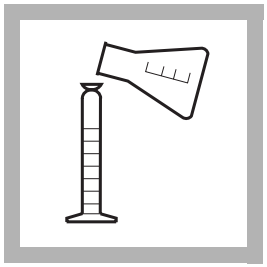
4. 뜨거워진 샘플을 실온으로 냉각 시킨다.

* Adapted from *Standard Methods for the Examination of Water and Wastewater.*



5. 2.0mL의 5.0 N Sodium Hydroxide Solution을 첨가하고 저어서 섞어준다.

Note: *Use the 1-mL calibrated dropper provided.*



6. 플라스크의 샘플을 눈금 실린더에 따른다. 플라스크에 증류수를 부어 세척해 주고 샘플량을 다시 25mL로 맞춰준다. 반응한 phosphorus로 알맞는 테스트를 시작한다.

Note: *Results of the reactive phosphorus test at this point will include the orthophosphate plus the acid-hydrolyzable (condensed) phosphate. The condensed phosphate concentration is determined by subtracting the results of a reactive phosphorus test on an untreated sample from this result. Make sure both results are in the same chemical form and units.*

REQUIRED REAGENTS

Description	Quantity Required Per Test	Unit	Cat. No.
Drinking Water Standard, Inorganic, F^-, $NO_3^{-N,}$ PO_4^{3-}, SO_4^{2-}		500 mL	28330-49
Sodium Hydroxide Solution, 5.0 N	2 mL	100 mL* MDB	2450-32
Sulfuric Acid Solution, 5.25 N	2 mL	100 mL* MDB	2449-32
Wastewater Effluent Standard, Inorganic (NH_3–N, NO_3–N, PO_4, COD, SO_4, TOC)		500 mL	28332-49
Wastewater Influent Standard, Inorganic (NH_3–N, NO_3–N, PO_4, COD, SO_4, TOC)		500 mL	28331-49

REQUIRED APPARATUS

Cylinder, graduated, 25 mL	2	each	508-40
Flask, erlenmeyer, 50 mL	1	each	505-41

OPTIONAL REAGENTS

Hydrochloric Acid, 6 N		500 mL	884-49
Water, deionized		4 L	272-56

OPTIONAL APPARATUS

Cylinder, graduated, 50 mL		each	508-41
Flask, erlenmeyer, 125 mL		each	505-43
Hot Plate, 4" diameter, 120 Vac		each	12067-01
Hot Plate, 4" diameter, 240 Vac		each	12067-02
Pad, cooling, 4" x 4"		each	18376-00
pH indicator Paper, 1 to 11 pH		5 rolls/pkg	391-33
pH Meter, *sension*™*1*, portable with electrode		each	51700-10
Thermometer, -20 to 110 °C, Non-Mercury		each	26357-02

For Technical Assistance, Price and Ordering

In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

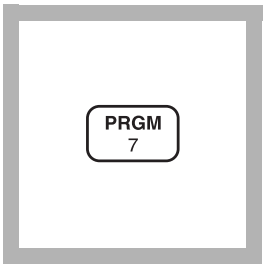
* Contact Hach for larger sizes.

PHOSPHORUS, REACTIVE (0.00 to 5.00 mg/L PO_4^{3-})

PhosVer 3 Method, Test 'N Tube Procedure

For water, wastewater, and seawater

USEPA accepted for reporting wastewater analysis*



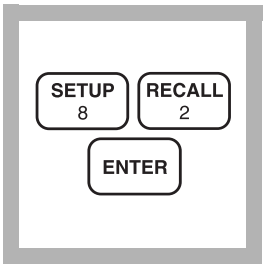
1. reactive phosphorus 의 Test' N Tube 방식 측정을 위해 번호를 선택한다.

Press: **PRGM**

The display will show:

PRGM ?

Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*



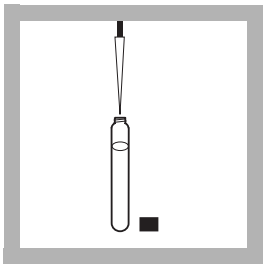
2. 82번을 선택하고

ENTER. 화면에 **mg/L, PO4**와 **ZERO** 아이콘이 나타난다**.**

Note: *For alternate forms (P, P_2O_5), press the* **CONC** *key.*

3. COD/TNT 아답타를 셀 홀더에 맞춰 끼운다.

Note: *A diffuser band covers the light path holes on the adapter to give increased performance.The band should NOT be removed.*



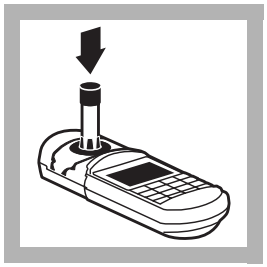
4. TenSette 피펫으로 샘플 5mL을 Reactive Phosphorus Test 'N Tube Dilution Vial을 첨가하고 뚜껑을 닫고 섞어준다.

Note: *For samples with extreme pH, see the* Interference *section.*

* Procedure is equivalent to USEPA Method 365.2 and Standard Method 4500-P E for wastewater.

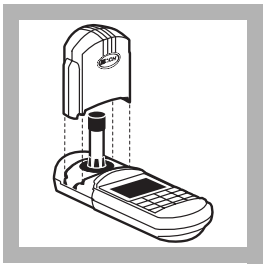
5. 바이알의 표면을 깨끗이 닦아준다.

Note: *Wiping with a damp towel, followed by a dry one, will remove fingerprints or other marks.*

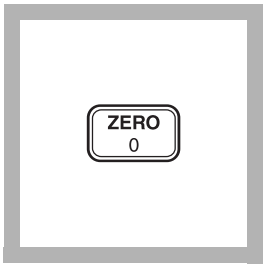


6. 샘플 바이알을 아답타에 맞춰 끼운다.

Note: *Do not move the vial from side to side as this can cause errors.*



7. 기기 덮개를 덮는다.

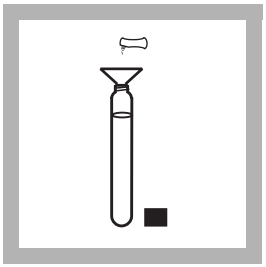


8. **ZERO**키를 누른다.

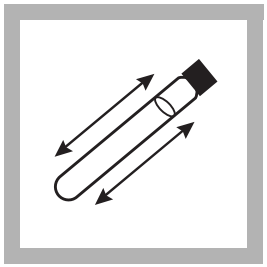
화면에 다음과 같이 나타난다:

0.00 mg/L PO4

Note: *For multiple samples, zero only on the first sample. Read the remaining samples after adding the PhosVer 3 Reagent.*

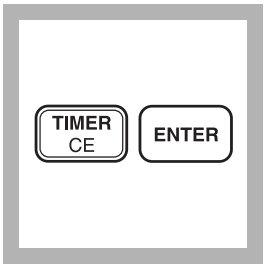


9. PhosVer 3 Phosphate Powder Pillow를 바이알에 첨가한다.



10. 뚜껑을 닫고 10~15초간 흔들어서 섞어준다.

Note: *The powder will not completely dissolve.*



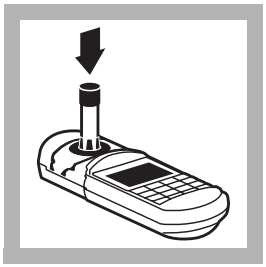
11. 다음 버튼을 누른다:

TIMER ENTER

2분간의 반응시간이 시작된다.

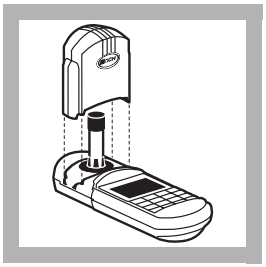
Note: *Read samples between 2 and 8 minutes after the addition of the PhosVer 3 reagent.*

Note: *A blue color will develop if phosphate is present.*

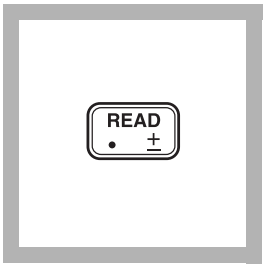


12. 타이머가 울린 후, 즉시 바이알을 셀 홀더에 맞춰 끼운다.

Note: *Do not move the vial from side to side as this can cause errors.*



13. 기기 덮개를 덮는다.



14. **READ**키를 누른다.

화면에 결과치가 mg/L phosphate (PO_4^{3-}) 로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Section 1).*

REQUIRED REAGENTS

Reactive Phosphorus Test 'N Tube Reagent Set ..... 50 tests 27425-45
Includes: (1) 21060-46, (50) Orthophosphate Dilution Vials*

Description	Quantity Required Per Test	Unit	Cat. No.
PhosVer 3 Phosphate Reagent Powder Pillows	1	50/pkg	21060-46
50 Orthophosphate Test 'N Tube Dilution Vials	1	50/pkg	*

REQUIRED APPARATUS

COD/TNT Adapter	1	each	48464-00
Funnel, micro	1	each	25843-35
Pipet, TenSette, 1 to 10 mL	1	each	19700-10
Pipet Tips, for 19700-10 TenSette Pipet	1	50/pkg	21997-96
Test Tube Rack	1-3	each	18641-00

OPTIONAL REAGENTS

Bromine Water, 30 g/L	29 mL	2211-20
Drinking Water Standard, Inorganic, F^-, $NO_3^{-N,}$ PO_4^{3-}, SO_4^{2-}	500mL	28330-49
Hydrochloric Acid Standard Solution, 6.0 N (1:1)	500 mL	884-49
Phenol Solution, 30 g/L	29 mL	2112-20
Phosphate Standard Solution, 1 mg/L as PO_4^{3-}	500 mL	2569-49
Phosphate Standard Solution, Voluette ampule, 50 mg/L as PO_4^{3-}, 10 mL	16/pkg	171-10
Phosphate Standard Solution, PourRite ampule, 50 mg/L as PO_4^{3-}, 2 mL	20/pkg	171-20H
Wastewater Effluent Standard, Inorganic (NH_3–N, NO_3–N, PO_4, COD, SO_4, TOC)	500 mL	28332-49
Water, deionized	4 L	272-56

* These items are not sold separately.

OPTIONAL APPARATUS

Ampule Breaker, Pour Rite (2-mL ampule)	each	24846-00
Ampule Breaker Kit	each	21968-00
Aspirator, vacuum	each	2131-00
Cylinder, graduated, mixing, 25 mL (3 required)	each	20886-40
Dispenser, Repipet Jr., 2 mL	each	22307-01
Filter Holder, 47 mm, 300 mL, graduated	each	13529-00
Filter, membrane, 47 mm, 0.45 microns	100/pkg	13530-00
Flask, filtering, 500 mL	each	546-49
Flask, volumetric, Class A, 100 mL	each	14574-42
pH Indicator Paper, 1 to 11 pH units	5 rolls/pkg	391-33
pH Meter, *sension™1*, portable with electrode	each	51700-10
Pipet, TenSette, 0.1 to 1.0 mL	each	19700-01
Pipet Tips, for 19700-01	50 pkg	21856-96
Pipet Tips, for 19700-01	1000/pkg	21856-28
Pipet Filler, Safety Bulb	each	14651-00
Pipet, volumetric, Class A, 5.00 mL	each	14515-37
Pipet, volumetric, Class A, 2.00 mL	each	14515-36

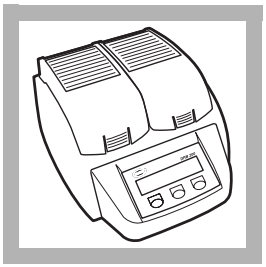
For Technical Assistance, Price and Ordering

In the U.S.A. call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

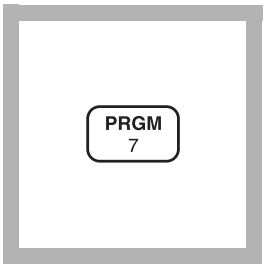
PHOSPHORUS, TOTAL (0.00 to 3.50 mg/L PO_4^{3-}) For water, wastewater and seawater

PhosVer 3 with Acid Persulfate Digestion* USEPA Accepted for reporting wastewater analysis** Test 'N Tube Procedure



1. DRB200 가열 전처리기를 켜서 150°C 로 예열한다.

Note: *See DRB200 instrument manual for selecting preprogrammed temperature applications.*



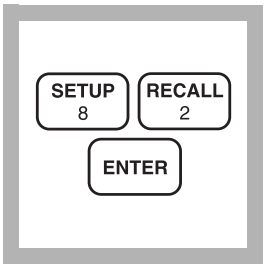
2. 다음 항목 측정을 위해 번호를 선택한다: total phosphorus, (PO_4^{3-}), Test 'N Tube.

Press: **PRGM**

The display will show:

PRGM ?

Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*



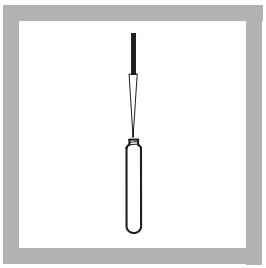
3. 82번을 선택하고

ENTER. 화면에 **mg/L, PO4**와 **ZERO** 아이콘이 표시된다.

Note: *For alternate forms (P, P_2O_5), press the* **CONC** *key.*

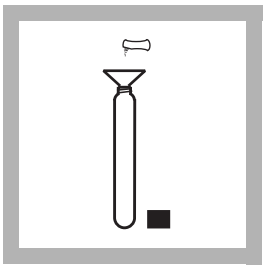
4. COD/TNT 아답타를 셀 홀더에 맞춰 끼운다.

Note: *A diffuser band covers the light path holes on the adapter to give increased performance. The band should NOT be removed.*

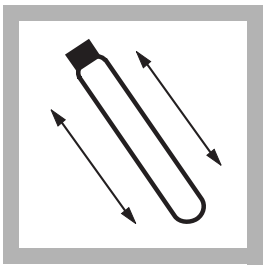


5. TenSette 피펫으로 샘플 5.0mL을 Total and Acid Hydrolyzable Test Vial에 담는다.

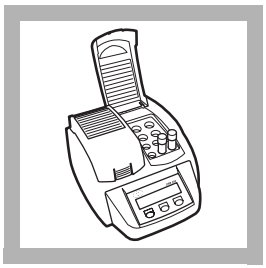
Note: *Adjust the pH of stored samples to 6-8 before analysis.*



6. Potassium Persulfate Powder Pillow for Phosphonate를 바이알에 첨가한다.



7. 뚜껑을 닫고 흔들어서 용해시킨다.



8. 바이알을 전처리기에 넣고 30분간 가열한다.

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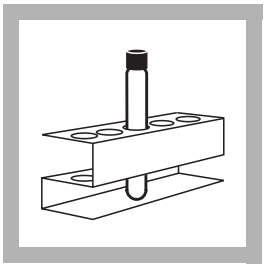
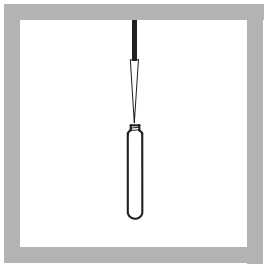
* Adapted from *Standard Methods for the Examination of Water and Wastewater.*

** Procedure is equivalent to USEPA Method 365.2 and Standard Method 4500-P B, 5 and P.E.

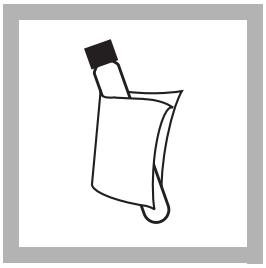


9. 바이알을 전처리기에서 꺼낸 후, 랙에 두고 실온으로 공냉시킨다.

Note: *Vials will be hot.*

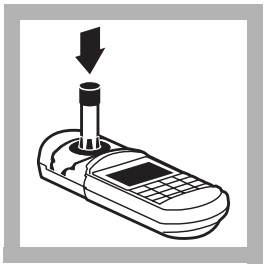


10. TenSette 피펫으로 1.54N sodium hydroxide 2mL을 바이알에 첨가하고 뚜껑을 닫은 후, 섞어준다.



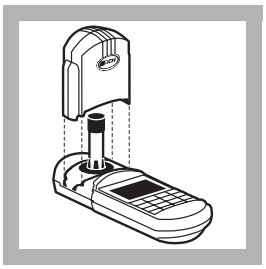
11. 바이알 표면을 깨끗이 닦아준다.

Note: *Wiping with a damp towel, followed by a dry one, will remove fingerprints or other marks.*

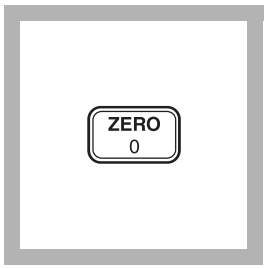


12. 샘플 바이알을 아답타에 맞춰 끼운다.

Note: *Do not move the vial from side to side as this can cause errors.*



13. 기기 덮개를 덮는다.

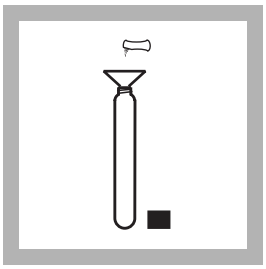


14. **ZERO**키를 누른다.

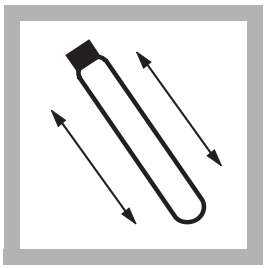
화면에 다음처럼 나타난다:

0.00 mg/L PO4

Note: *For multiple samples, zero only on the first sample. Read the remaining samples after adding the PhosVer 3 reagent.*

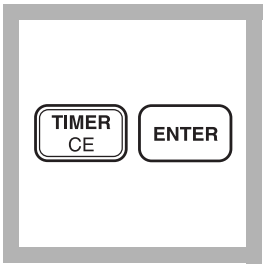


15. 바이알 뚜껑을 열고 PhosVer 3 Phosphate Reagent Powder Pillow를 하나 첨가한다.



16. 뚜껑을 단단히 닫고 15초간 흔들어 섞어준다.

Note: *The powder will not completely dissolve.*



17. 다음 버튼을 누른다:

TIMER ENTER

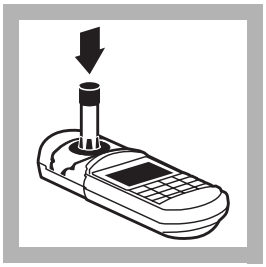
2분간의 대기 시간이 표시된다.

Note: *Read samples between 2 and 8 minutes after the addition of the PhosVer 3 reagent.*

Note: *A blue color will form if phosphate is present.*

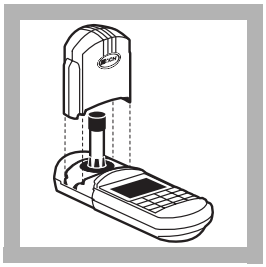
18. 타이머가 울린 후, 샘플 바이알의 표면을 깨끗이 닦아준다.

Note: *Wiping with a damp towel, followed by a dry one, will remove fingerprints or other marks.*

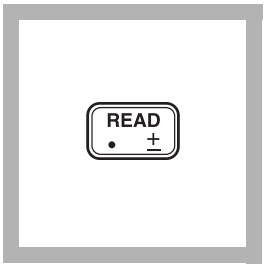


19. 바이알을 아답타에 맞춰 끼운다.

Note: *Do not move the vial from side to side as this can cause errors.*



20. 기기 덮개를 덮는다.



21. **READ**키를 누른다.

화면에 결과치가 mg/L phosphate (PO_4^{3-}) 로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Section 1).*

IMPORTANT NOTE:

The test range for total phosphate is limited to 0 to 3.5 mg/L PO_4^{3-}. Values above 3.5 mg/L may be used to estimate dilution ratios, but should NOT be used for reporting purposes. If a value above 3.5 mg/L PO_4^{3-} is obtained, dilute the sample and repeat the digestion and the colorimetric test.

REQUIRED REAGENTS

Total Phosphorus Test 'N Tube Reagent Set.....50 tests 27426-45
Includes: (1) 272-42, (1) 20847-66, (1) 21060-46, (1) 27430-42, (50) Acid Dilution Vials*

Description	Quantity Required Per Test	Unit	Cat. No.
PhosVer 3 Phosphate Reagent Powder Pillows	1	50/pkg	21060-46
Potassium Persulfate powder Pillows	1	50/pkg	20847-66
Sodium Hydroxide Solution, 1.54 N	2 mL	100 mL	27430-42
Test 'N Tube Acid Dilution Vials	1	50/pkg	*
Water, deionized for reagent blank	5 mL	100 mL	272-42

REQUIRED APPARATUS

COD/TNT Adapter	1	each	48464-00
DRB 200 Reactor, 110 V, 15 x 16 mm tubes			LTV082.53.40001
DRB 200 Reactor, 220 V, 15 x 16 mm tubes			LTV082.52.40001
Funnel, micro	1	each	25843-35
Test Tube Rack	1-3	each	18641-00
Pipet, TenSette, 1 to 10 mL	1	each	19700-10
Pipet Tips, for 19700-10 TenSette Pipet	varies	50/pkg	21997-96

OPTIONAL REAGENTS

Description	Unit	Cat. No.
Drinking Water Standard, Inorganic, F^-, $NO_3^{-N,}$ PO_4^{3-}, SO_4^{2-}	500mL	28330-49
Total and Acid Hydrolyzable Test 'N Tube Reagent Set	each	27427-45
Hydrochloric Acid Standard Solution, 6.0 N (1:1)	500 mL	884-49
Phosphate Standard Solution, 1 mg/L as PO_4^{3-}	500 mL	2569-49
Phosphate Standard Solution, PourRite ampule, 50 mg/L as PO_4^{3-}, 2 mL	20/pkg	171-20H
Phosphate Standard Solution, Voluette ampule, 50 mg/L as PO_4^{3-}, 10 mL	16/pkg	171-10
Sodium Hydroxide Standard Solution, 5.0 N	1 L	2450-53
Total and Acid Hydrolyzable Test 'N Tube Reagent Set	each	27427-45
Wastewater Effluent Standard, Inorganic (NH_3–N, NO_3–N, PO_4, COD, SO_4, TOC)	500 mL	28332-49
Water, deionized	4 L	272-56

* These items are not sold separately.

OPTIONAL APPARATUS

Ampule Breaker Kit ..... each.....21968-00
Ampule Breaker, PourRite ampules ..... each.....24846-00
DRB 200 Reactor, 110 V, 21 x 16 mm and 4 x 20 mm LTV082.53.42001
DRB 200 Reactor, 220 V, 21 x 16 mm and 4 x 20 mm LTV082.52.42001
DRB 200 Reactor, 110 V, 9 x 16 mm and 2 x 20 mm LTV082.53.30001
DRB 200 Reactor, 220 V, 9 x 16 mm and 2 x 20 mm LTV082.52.30001
Cylinder, graduated, mixing, 25 mL (3 required) ..... each.....20886-40
pH Indicator Paper, 1 to 11 pH units ..... 5 rolls/pkg.....391-33
pH Meter, *Sension™1*, portable with electrodes ..... each.....51700-10
Pipet Filler, safety bulb ..... each.....14651-00
Pipet, volumetric, Class A, 5.00 mL ..... each.....14515-37
Pipet, volumetric, Class A, 2.00 mL ..... each.....14515-36
Pipet, TenSette, 0.1-1.0 mL ..... each.....19700-01
Pipet Tips, for 19700-01 TenSette Pipet ..... 50/pkg.....21856-96
Pipet Tips, for 19700-01 .... 1000/pkg.....21856-28

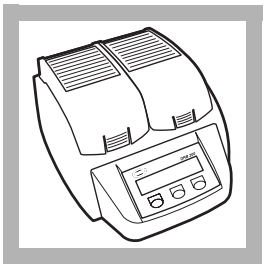
For Technical Assistance, Price and Ordering

In the U.S.A. call 800-227-4224
Outside the U.S.A.—Contact the Hach office or distributor serving you.

PHOSPHORUS, ACID HYDROLYZABLE (0.00 to 5.00 mg/L PO_4^{3-})

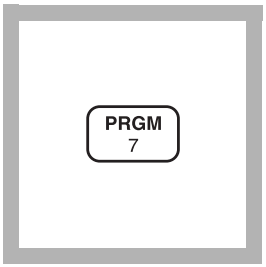
PhosVer 3 with Acid Hydrolysis Test 'N Tube™ Procedure

For water, wastewater, and seawater



1. COD 전처리기를 켜서 150°C로 예열한다.

Note: *See DRB200 instrument manual for selecting preprogrammed temperature applications.*



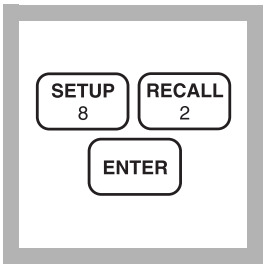
2. 다음 항목의 측정 번호를 선택한다: acid hydrolyzable phosphorus (PO_4^{3-}), Test 'N Tube.

Press: **PRGM**

The display will show:

PRGM ?

Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*



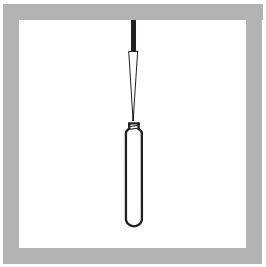
3. 82번을 선택하고

ENTER. 화면에 **mg/L, PO4**와 **ZERO** 아이콘이 표시된다**.**

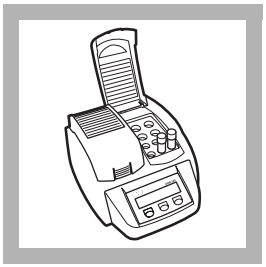
Note: *For alternate forms (P, P_2O_5), press the* **CONC** *key.*

4. COD/TNT 아답타를 셀 홀더에 맞춰 끼운다.

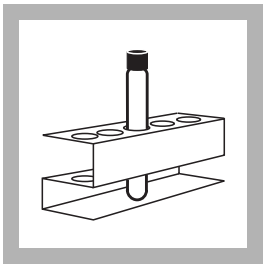
Note: *A diffuser band covers the light path holes on the adapter to give increased performance. The band should NOT be removed.*



5. TenSette 피펫으로 샘플 5.0mL을 Total and Acid Hydrolyzable Test Vial에 첨가하고 뚜껑을 닫은 후 섞어준다.

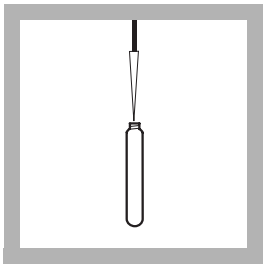


6. 예열된 전처리기에 바이알을 넣고 30분간 가열한다.



7. 가열된 바이알을 전처리기에서 꺼내어 랙에 두고 실온으로 공냉시킨다.

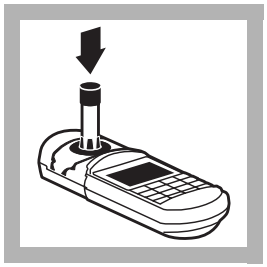
Note: *Vials will be hot.*



8. 바이알 뚜껑을 열고 2.0mL의 1.00 N sodium hydroxide를 첨가한다. 다시 뚜껑을 닫고 섞어준다.

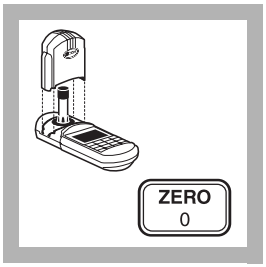
9. 바이알 표면을 깨끗이 닦아준다.

Note: *Wiping with a damp towel, followed by a dry one, will remove fingerprints or other marks.*



10. 바이알을 아답타에 맞춰 끼운다.

Note: *Do not move the vial from side to side as this can cause errors.*



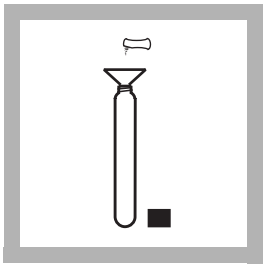
11. 기기 덮개를 덮는다.

ZERO키를 누른다.

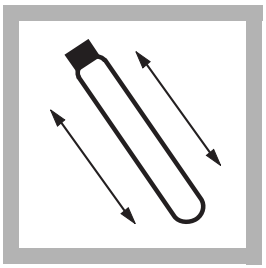
화면에 다음처럼 나타난다:

0.00 mg/L PO4

Note: *For multiple samples, zero on the first sample. Read the remaining samples after adding the PhosVer 3 reagent. Subtract the reagent blank value from each reading.*

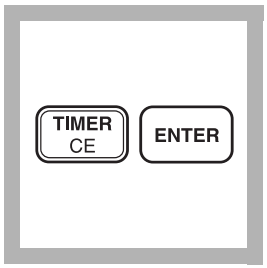


12. 바이알 뚜껑을 열고 PhosVer 3 Phosphate Reagent Powder Pillow 를 하나 첨가한다.



13. 뚜껑을 단단히 닫고 10~15초간 흔든다.

Note: *The powder will not completely dissolve.*



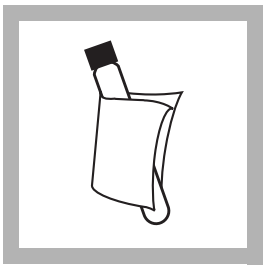
14. 다음 버튼을 누른다:

TIMER ENTER

2분간의 반응 시간이 시작된다.

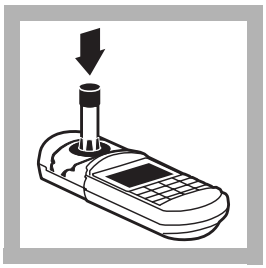
Note: *Read samples between 2 and 8 minutes after adding the PhosVer 3 reagent.*

Note: *A blue color will form if phosphate is present.*



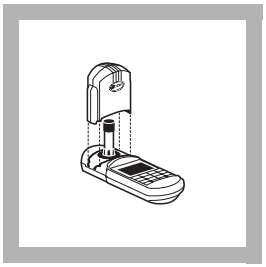
15. 타이머가 울린 후, 바이알 표면을 깨끗이 닦아준다.

Note: *Wiping with a damp towel, followed by a dry one, will remove fingerprints or other marks.*

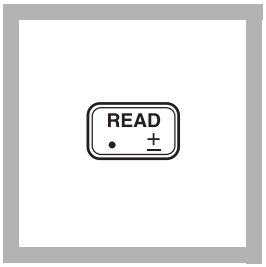


16. 바이알을 아답타에 맞춰서 끼운다.

Note: *Do not move the vial from side to side as this can cause errors.*



17. 기기 덮개를 덮는다.



18. **READ**키를 누른다.

화면에 결과치가 mg/L phosphate (PO_4^{3-})로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Section 1).*

REQUIRED REAGENTS

Total and Acid Hydrolyzable Test ’N Tube Reagent Set ..... 50 tests 27427-45
Includes: (1) 272-42, (1) 1045-42, (1) 20847-66, (1) 21060-46, (50) Total and Acid Hydrolyzable Test Vials* (1) 27430-42

Description	Quantity Required Per Test	Unit	Cat. No.
PhosVer 3 Phosphate Reagent Powder Pillows	1	50/pkg	21060-46
Potassium Persulfate powder Pillows	1	50/pkg	20847-66
Sodium Hydroxide Solution, 1.0 N	2 mL	100 mL	1045-42
Total and Acid Hydrolyzable Test Vials	1	50/pkg	*
Water, deionized for reagent blanks	5 mL	100 mL	272-42

REQUIRED APPARATUS

Description	Quantity Required Per Test	Unit	Cat. No.
COD/TNT Adapter	1	each	48464-00
DRB 200 Reactor, 110 V, 15 x 16 mm tubes			LTV082.53.40001
DRB 200 Reactor, 220 V, 15 x 16 mm tubes			LTV082.52.40001
Funnel, micro	1	each	25843-35
Pipet, TenSette, 1 to 10 mL	1	each	19700-10
Pipet Tips, for 19700-10 TenSette Pipet		50/pkg	21997-96
Test Tube Rack	1-3	each	18641-00

OPTIONAL REAGENTS

Bromine Water, 30 g/L	29 mL	2211-20
Drinking Water Standard, Inorganic, F^-, $NO_3^{-N,}$ PO_4^{3-}, SO_4^{2-}	500mL	28330-49
Hydrochloric Acid Standard Solution, 6.0 N (1:1)	500 mL	884-49
Phenol Solution, 30 g/L	29 mL	2112-20
Phosphate Standard Solution, 1 mg/L as PO_4^{3-}	500 mL	2569-49
Phosphate Standard Solution, PourRite ampule, 50 mg/L as PO_4^{3-}, 2 mL	20/pkg	171-20H
Phosphate Standard Solution, Voluette ampule, 50 mg/L as PO_4^{3-}, 10 mL	16/pkg	171-10
Sodium Hydroxide Standard Solution, 5.000 N	1000 mL	2450-53
Sulfuric Acid Standard Solution, 1.000 N	1 L	1270-53
Wastewater Effluent Standard, Inorganic (NH_3–N, NO_3–N, PO_4, COD, SO_4, TOC)	500 mL	28332-49
Water, deionized	4 L	272-56

* These items are not sold separately.

OPTIONAL APPARATUS

Description	Units	Cat. No.
Ampule Breaker Kit, Voluette	each	21968-00
Ampule Breaker, PourRite	each	24846-00
Cylinder, graduated, mixing, 25 mL (3 required)	each	20886-40
DRB 200 Reactor, 110 V, 21 x 16 mm and 4 x 20 mm		LTV082.53.42001
DRB 200 Reactor, 220 V, 21 x 16 mm and 4 x 20 mm		LTV082.52.42001
DRB 200 Reactor, 110 V, 9 x 16 mm and 2 x 20 mm		LTV082.53.30001
DRB 200 Reactor, 220 V, 9 x 16 mm and 2 x 20 mm		LTV082.52.30001
Flask, volumetric, Class A, 100 mL	each	14574-42
pH Indicator Paper, 1 to 11 pH units	5 rolls/pkg	391-33
pH Meter, *sension*™*1*, portable with electrode	each	51700-10
Pipet, TenSette, 0.1-1.0 mL	each	19700-01
Pipet Tips, for 19700-01 TenSette Pipet	50/pkg	21856-96
Pipet Tips, for 19700-01	1000/pkg	21856-28
Pipet, volumetric, Class A, 5.00 mL	each	14515-37
Pipet, volumetric, Class A, 2.00 mL	each	14515-36
Pipet Filler, safety bulb	each	14651-00

For Technical Assistance, Price and Ordering

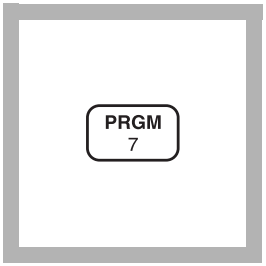
In the U.S.A. call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

PHOSPHORUS, REACTIVE (0 to 30.0 mg/L PO_4^{3-})

Amino Acid Method*

For water, wastewater, seawater



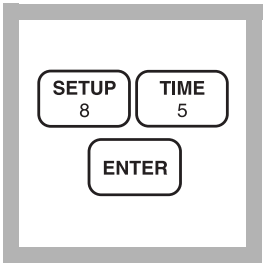
1. 다음 항목의 측정 번호를 선택한다: reactive phosphate (PO_4^{3-}), amino acid method.

Press: **PRGM**

The display will show:

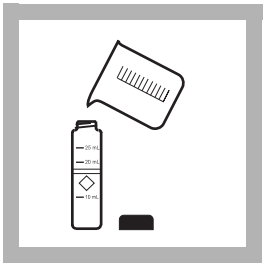
PRGM ?

Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*

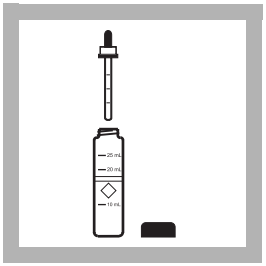


2. 85번을 선택하고 **ENTER.** 화면에 **mg/L, PO4**와 **ZERO** 아이콘이 나타난다.

Note: *For alternate forms (P, P_2O_5), press* **CONC**.

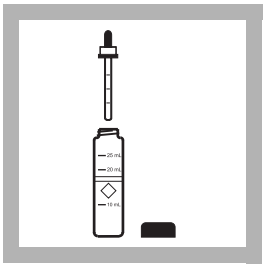


3. 샘플셀에 샘플을 25mL 담는다.



4. 1mL의 Molybdate Reagent를 첨가한다.

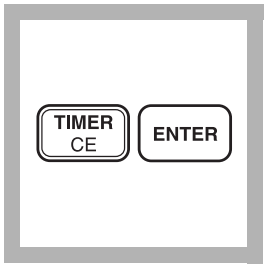
* Adapted from *Standard Methods for the Examination of Water and Wastewater.*



5. 1mL의 Amino Acid Reagent Solution을 첨가하고 흔들어서 섞어준다. (the prepared sample)

Note: *A blue color will form if phosphate is present.*

Note: *You may substitute the contents of one Amino Acid Reagent Powder Pillow for 1 mL of Amino Acid Reagent Solution.*

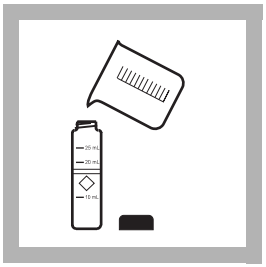


6. 다음 버튼을 누른다:

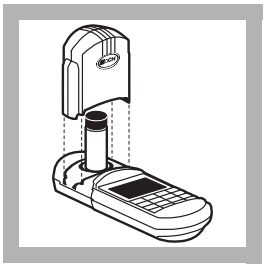
TIMER ENTER

10분간의 반응시간이 시작된다.

Note: *Perform Step 7 while the timer is running.*



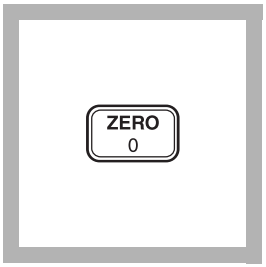
7. 다른 샘플셀에 샘플 25mL을 담는다. (the blank)



8. 타이머가 울리면, 화면에 다음처럼 나타난다:

mg/L PO4

blank를 셀 홀더에 넣고 기기 덮개를 덮는다.

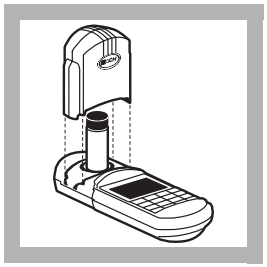


9. **ZERO**키를 누른다.

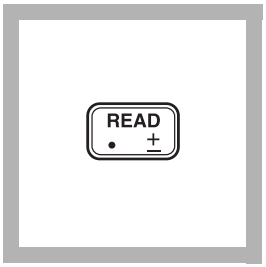
화면에 다음처럼 나타난다:

0.0 mg/L PO4

Note: *If Reagent Blank Correction is on, the display may flash "limit". See Section 1.*



10. 측정할 샘플을 셀 홀더에 넣고 기기 덮개를 덮는다.



11. **READ**키를 누른다.

화면에 결과치가 mg/L PO_4 로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Section 1).*

REQUIRED REAGENTS

	Cat. No.
High Range Reactive Phosphorus Reagent Set (100 Test)	22441-00
Includes: (1) 1934-32, (1) 2236-32	

Description	Quantity Required Per Test	Units	Cat. No.
Amino Acid Reagent	1 mL	100 mL MDB*	1934-32
Molybdate Reagent	1 mL	100 mL MDB*	2236-32

REQUIRED APPARATUS

Sample Cell, 10-20-25 mL, w/ cap	2	6/pkg	24019-06

OPTIONAL REAGENTS

Description	Units	Cat. No.
Amino Acid Reagent Powder Pillow	100/pkg	804-99
Bromine Water, 30 g/L	29 mL	2211-20
Hydrochloric Acid Solution, 1:1 (6 N)	500 mL	884-49
Phenol Solution, 30 g/L	29 mL	2112-20
Phosphate Standard Solution, 50 mg/L PO_4^{3-}	500 mL	171-49
Phosphate Standard Solution, PourRite ampule, 500 mg/L PO_4^{3-}, 2 mL	20/pkg	14242-20
Sodium Hydroxide Standard Solution, 5.0 N	100 mL MDB	2450-32
Sulfamic Acid	113 g	2344-14
Sulfuric Acid Standard Solution, 10 N	1 L	931-53
Wastewater Influent Standard, Inorganic (NH_3–N, NO_3–N, PO_4, COD, SO_4, TOC)	500 mL	28331-49
Water, deionized	4 L	272-56

* Larger sizes available.

OPTIONAL APPARATUS

Description	Unit	Cat. No.
Ampule Breaker Kit, PourRite	each	24846-00
Aspirator, vacuum	each	2131-00
Cylinder, graduated, 50 mL	each	508-41
Cylinder, graduated, mixing, 25 mL	each	20886-40
Filter Holder, 47 mm, 300 mL, graduated	each	13529-00
Filter, membrane, 47 mm, 0.45 microns	100/pkg	13530-00
Flask, filtering, 500 mL	each	546-49
Flask, erlenmeyer, 125 mL	each	505-43
Flask, volumetric, Class A, 50 mL	each	14574-41
pH Indicator Paper, 1 to 11 pH	5 rolls/pkg	391-33
pH Meter, *sension*™*1*, portable with electrode	each	51700-10
Pipet, serological, 2.0 mL	each	532-36
Pipet, TenSette, 0.1 to 1.0 mL	each	19700-01
Pipet Tips, for 19700-01 TenSette Pipet	50/pkg	21856-96
Pipet Tips, for 19700-01	1000/pkg	21856-28
Pipet, volumetric, Class A, 10.00 mL	each	14515-38
Pipet Filler, safety bulb	each	12189-00
Spoon, measuring, 0.05 g	each	492-00
Thermometer, -20 to 110 °C, Non-Mercury	each	26357-02

For Technical Assistance, Price and Ordering

In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

PHOSPHORUS, REACTIVE, HR (0.0 to 100.0 mg/L PO_4^{3-})

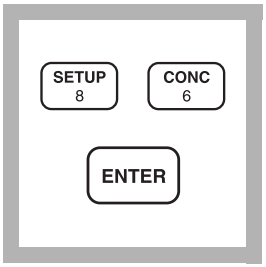
Molybdovanadate Method*, Test ’N Tube™ Procedure **For water and wastewater**

1. 다음 항목 측정을 위해 번호를 선택한다: phosphorus, reactive, high range, Test ’N Tube.

Press: **PRGM**

The display will show:

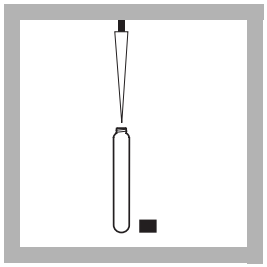
PRGM ?



2. 86번을 선택하고

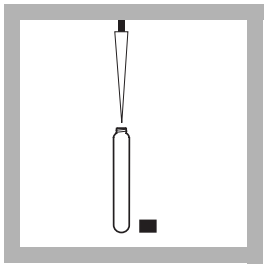
ENTER. 화면에 **mg/L, PO4**와 **ZERO** 아이콘이 표시된다.

Note: *For alternate forms (P, P_2O_5), press the* **CONC** *key.*



3. TenSette 피펫을 사용해서 증류수 5.0mL을 ReactiveHigh Range Phosphorus Test 'N Tube Vial에 담는다.
(the blank)

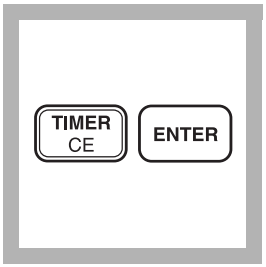
뚜껑을 닫고 섞어준다.



4. 다른 Reactive High Range Phosphorus Test 'N Tube Vial에 샘플 5.0mL을 담는다.
(the sample)

뚜껑을 닫고 섞어준다.

Note: *For samples with extreme pH, see the Interference section.*



5. 다음 버튼을 누른다:

TIMER ENTER

7분간의 반응시간이 나타난다.

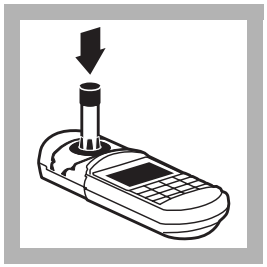
Note: *This reaction time is for samples at 23 °C (73 °F). If the sample temperature is 13 °C (55 °F), wait 15 minutes. If the sample temperature is 33 °C (91 °F), wait two minutes.*

6. COD/TNT 아답타를 셀 홀더에 맞춰 끼운다.

Note: *A diffuser band covers the light path holes on the adapter to give increased performance. The band should NOT be removed.*

7. 바이알 표면을 깨끗이 닦아준다.

Note: *Wipe with a damp towel, followed by a dry one, to remove fingerprints or other marks.*

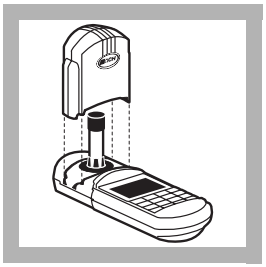


8. 타이머가 울리면 blank를 아답타에 맞춰 끼운다.

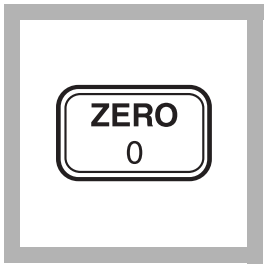
Note: *Do not move the vial from side to side as this can cause errors.*

---

* Adapted from *Standard Methods for the Examination of Water and Wastewater.*



9. 기기 덮개를 덮는다.

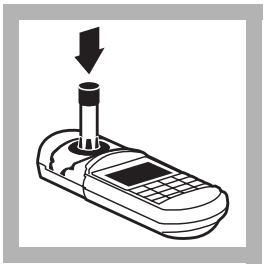


10. **ZERO**키를 누른다.

화면에 다음처럼 나타난다:

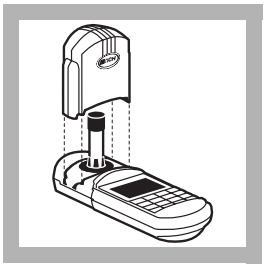
0.0 mg/L PO4

Note: *Reagent blanks for each lot of reagent may be used more than once. At room temperature, the reagent blank is stable for as long as three weeks; then prepare a new one.*

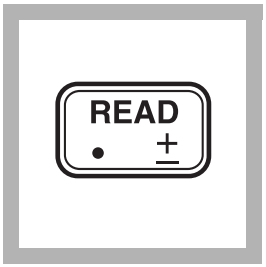


11. 샘플 바이알을 아답타에 맞춰 끼운다.

Note: *Do not move the vial from side to side as this can cause errors.*



12. 기기 덮개를 덮는다.



13. **READ**키를 누른다.

화면에 결과치가 mg/L phosphate (PO_4^{3-})로 나타난다

Note: *For best results, use Standard Adjust with each new lot of reagent. (See* Accuracy Check.*)*

REQUIRED REAGENTS

High Range Reactive Phosphorus Test 'N Tube™ Reagent Set .....50 vials 27673-45
Includes: (50) Reactive High Range Phosphorus Test 'N Tube™ Vials*, (2) 272-42

Description	Quantity Required Per Test	Unit	Cat. No.
Reactive High Range Phosphorus Test 'N Tube™ Vials	1	50/pkg	*
Water, deionized		100 mL	272-42

REQUIRED APPARATUS

COD/TNT Adapter for DR/800 Series	1	each	48464-00
Pipet, TenSette®, 1 to 10 mL	1	each	19700-10
Pipet Tips, for 19700-10 TenSette® Pipet	1	50/pkg	21997-96
Test Tube Rack	1–3	each	18641-00

OPTIONAL REAGENTS

Bromine Water, 30 g/L	29 mL**	2211-20
Hydrochloric Acid Standard Solution, 6.0 N (1:1)	500 mL	884-49
Phenol Solution, 30 g/L	29 mL	2112-20
Phosphate Standard Solution, PourRite ampule, 500 mg/L as PO_4^{3-}, 2 mL	20/pkg	14242-20
Phosphate Standard Solution, Voluette ampule, 500 mg/L as PO_4^{3-}, 10 mL	16/pkg	14242-10
Wastewater Influent Standard, Inorganic (NH_3–N, NO_3–N, PO_4, COD, SO_4, TOC)	500 mL	28331-49

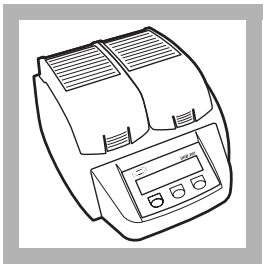
OPTIONAL APPARATUS

Ampule Breaker Kit	each	21968-00
Aspirator, vacuum	each	2131-00
Cylinder, graduated, mixing, 10 mL, 3 required	each	20886-38
Filter Holder, 47 mm, 300 mL, graduated	each	13529-00
Filter, membrane, 47 mm, 0.45 microns	200/pkg	13530-00
Flask, filtering, 500 mL	each	546-49
Flask, volumetric, Class A, 50-mL	each	14574-41
pH Indicator Paper, 1 to 11 pH units	5 rolls/pkg	391-33
pH Meter, *sension*™*1*, portable with electrode	each	51700-10
Pipet, TenSette®, 0.1 to 1.0 mL	each	19700-01
Pipet Tips, for 19700-01 TenSette® Pipet	50/pkg	21856-96
Pipet Tips, for 19700-01 TenSette® Pipet	1000/pkg	21856-28
Pipet Tips, for 19700-10 TenSette® Pipet	250/pkg	21997-25
Pipet, volumetric, Class A, 5.00-mL	each	14515-37
Pipet, volumetric, Class A, 8.00-mL	each	14515-08
PourRite™ Ampule Breaker	each	24846-00

* These items are not sold separately.
** Larger sizes available.

PHOSPHORUS, TOTAL, HR (0.0 to 100.0 mg/L PO_4^{3-})

Molybdovanadate Method with Acid Persulfate Digestion*
Test ’N Tube™ Procedure **For water and wastewater**



1. DRB200 전처리기를 150°C로 예열한다.

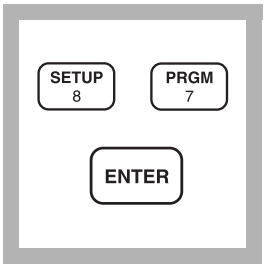
Note: *See DRB200 instrument manual for selecting preprogrammed temperature applications*

2. 다음 항목의 측정 번호를 선택한다: phosphorus total high range, Test ‘N `Tube.

Press: **PRGM**

The display will show:

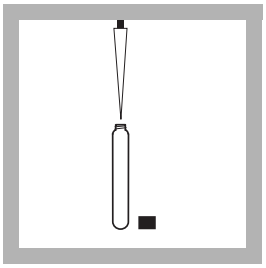
PRGM ?



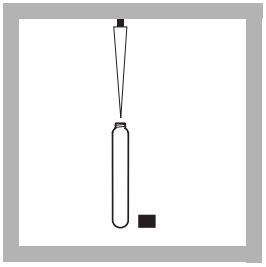
3. **87**번을 선택하고

ENTER. 화면에 **mg/L, PO4**와 **ZERO** 아이콘이 표시된다.

Note: *For alternate forms (P, P_2O_5), press the* **CONC** *key.*

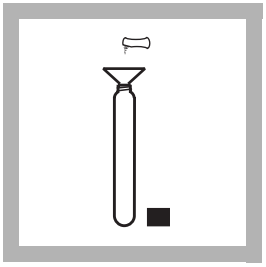


4. TenSette 피펫으로 5.0mL의 증류수를 Total Phosphorus Test 'N Tube Vial에 담는다. (the blank)

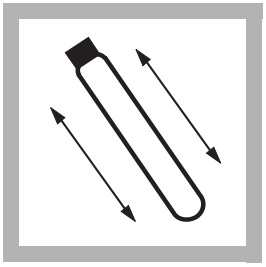


5. 5.0mL의 샘플을 다른 Total Phosphorus Test 'N Tube Vial에 담는다. (the sample)

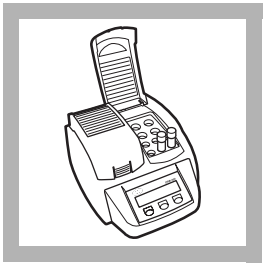
Note: *Adjust the pH of stored samples to 6–8 before analysis.*



6. Potassium Persulfate Powder Pillow for Phosphonate를 각 바이알에 첨가한다.



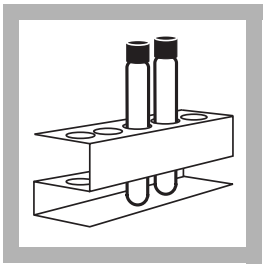
7. 바이알을 단단히 닫고 흔들어 용해시킨다.



8. 예열된 전처리기에 바이알을 넣고 30분간 가열한다.

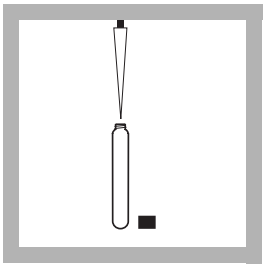
TIMER ENTER를 눌러서 가열시간을 확인한다.

* Adapted from *Standard Methods for the Examination of Water and Wastewater.*

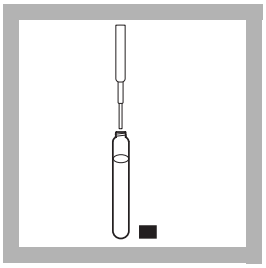


9. 가열이 끝난 바이알을 조심히 꺼내 랙에 두고 실온으로 냉각시킨다.

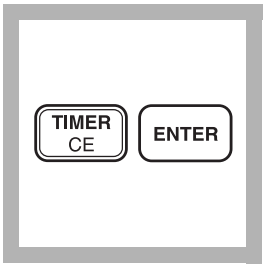
Note: *Vials will be hot.*



10. 1.54 N sodium hydroxide를 각 바이알에 2.0mL씩 첨가한다. 뚜껑을 닫고 섞어준다.



11. Molybdovanadate Reagent를 0.5mL씩 각 바이알에 첨가한다. 뚜껑을 닫고 섞어준다.



12. 다음 버튼을 누른다:

TIMER ENTER

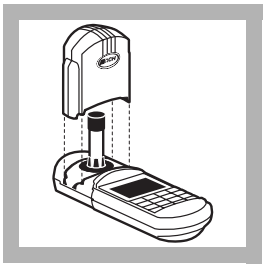
7분간의 반응시간이 시작된다.

Note: *Read the samples between 7 and 9 minutes.*

13. COD/TNT 아답타를 셀 홀더에 맞춰 끼운다.

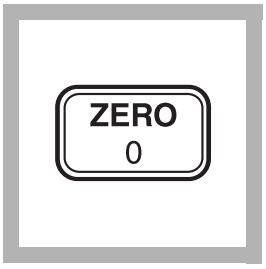
14. 바이알 표면을 깨끗이 닦아준다.

Note: *Wipe with a damp towel, followed by a dry one, to remove fingerprints or other marks.*



15. 타이머가 울린 후, blank를 아답타에 맞춰 끼운다.

Note: *Do not move the vial from side to side as this can cause errors.*

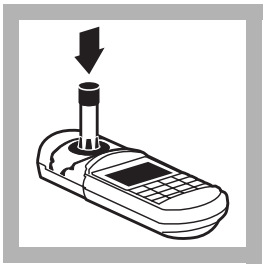


16. **ZERO**키를 누른다.

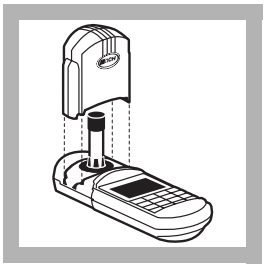
화면에 다음처럼 나타난다:

0.0 mg/L PO4

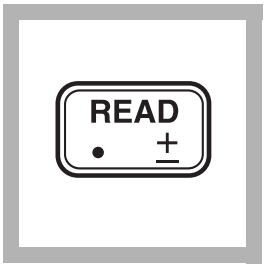
Note: *Reagent blanks for each lot of reagents may be used more than once, but should not be used for longer than one day.*



17. 샘플 바이알을 아답타에 맞춰 끼운다.



18. 기기 덮개를 덮는다.



19. **READ**키를 누른다.

Note: *Do not move the vial from side to side as this can cause errors.*

화면에 결과치가 mg/L phosphate (PO_4^{3-})로 나타난다.

Note: *For best results, use Standard Adjust with each new lot of reagent. (See* Accuracy Check.*)*

REQUIRED REAGENTS

Total High Range Phosphorus Test 'N Tube™ Reagent Set ..... 50 vials 27672-45
Includes: (50) Total Phosphorus Test 'N Tube™ Vials*, (2) 272-42, (1) 20847-66
(1) 20760-26, (1) 27430-42

Description	Quantity Required Per Test	Unit	Cat. No.
Molybdovanadate Reagent	0.5 mL	25 mL	20760-26
Potassium Persulfate Powder Pillows	1	50/pkg	20847-66
Sodium Hydroxide Solution, 1.54 N	2 mL	100 mL	27430-42
Total Phosphorus Test 'N Tube™ Vials	1	50/pkg	*
Water, deionized		100 mL	272-42

REQUIRED APPARATUS

DRB 200 Reactor, 110 V, 15 x 16 mm tubes			LTV082.53.40001
DRB 200 Reactor, 220 V, 15 x 16 mm tubes			LTV082.52.40001
COD/TNT Adapter, DR/800 series	1	each	48464-00
Dropper, LDPE, 0.5 to 1.0 mL	1	20/pkg	21247-20
Pipet, TenSette®, 1 to 10 mL	1	each	19700-10
Pipet Tips, for 19700-10 TenSette® Pipet	varies	50/pkg	21997-96
Test Tube Rack	1–3	each	18641-00

OPTIONAL REAGENTS

Description	Unit	Cat. No.
Hydrochloric Acid Standard Solution, 6.0 N (1:1)	500 mL	884-49
Phosphate Standard Solution, PourRite™ ampule, 500 mg/L as PO_4^{3-}, 2-mL	20/pkg	14242-20
Phosphate Standard Solution, Voluette™ ampule, 500 mg/L as PO_4^{3-}, 10-mL	16/pkg	14242-10
Sodium Hydroxide Standard Solution, 5.0 N	1 L	2450-53
Sulfuric Acid, ACS, concentrated	500 mL	979-491
Wastewater Influent Standard, Inorganic (NH_3–N, NO_3–N, PO_4, COD, SO_4, TOC)	500 mL	28331-49

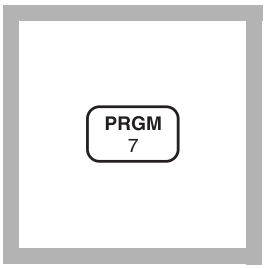
* These items are not sold separately.

OPTIONAL APPARATUS

Ampule Breaker Kit	each	21968-00
Aspirator, vacuum	each	2131-00
Cylinder, graduated, mixing, 10 mL (3 required)	each	20886-38
DRB 200 Reactor, 110 V, 21 x 16 mm and 4 x 20 mm		LTV082.53.42001
DRB 200 Reactor, 220 V, 21 x 16 mm and 4 x 20 mm		LTV082.52.42001
DRB 200 Reactor, 110 V, 9 x 16 mm and 2 x 20 mm		LTV082.53.30001
DRB 200 Reactor, 220 V, 9 x 16 mm and 2 x 20 mm		LTV082.52.30001
Filter Holder, 47 mm, 300 mL, graduated	each	13529-00
Filter, membrane, 47 mm, 0.45 microns	200/pkg	13530-01
Flask, filtering, 500-mL	each	546-49
Flask, volumetric, Class A, 50-mL	each	14574-41
pH Indicator Paper, 1 to 11 pH units	5 rolls/pkg	391-33
pH Meter, *sension*™*1*, portable with electrode	each	51700-10
Pipet Filler, Safety Bulb	each	14651-00
Pipet, TenSette®, 0.- to 1.0-mL	each	19700-01
Pipet Tips, for 19700-01	50/pkg	21856-96
Pipet Tips, for 19700-01	1000/pkg	21856-28
Pipet, volumetric, Class A, 8.00-mL	each	14515-08
Stopper, No. 7 one hole	6/pkg	2119-07
Tubing, rubber	12 feet	560-19

SILICA, Low Range (0 to 1.60 mg/L)

Heteropoly Blue Method*

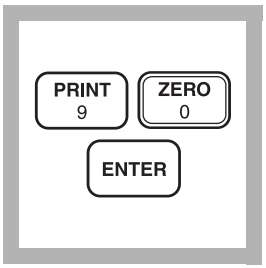


1. 다음 항목의 측정 번호를 선택한다: low range silica (SiO_2).

Press: **PRGM**

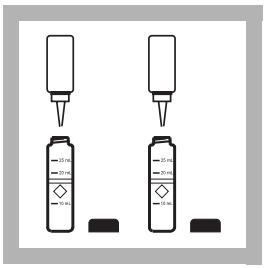
The display will show:

PRGM ?



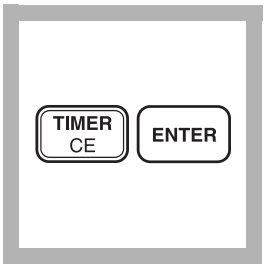
2. 90번을 선택하고 **ENTER.** 화면에 **mg/L, SiO2**와 **ZERO** 아이콘이 표시된다.

3. 샘플셀 두개에 각각 샘플을 10mL씩 채운다.



4. 각 샘플셀에 Molybdate 3 Reagent를 15방울씩 떨어뜨리고 섞어준다.

Note: *For greatest accuracy, hold dropping bottle vertical.*

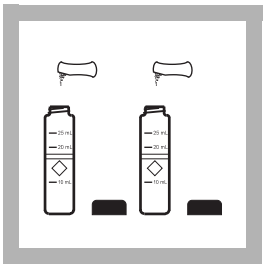


5. 다음 버튼을 누른다:

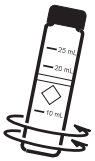
TIMER ENTER

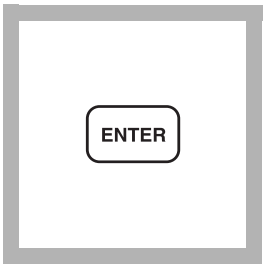
4분간의 반응시간이 시작된다.

Note: *Reaction time given is for samples at 20 °C (68 °F). If the sample temperature is 10 °C (50 °F), wait 8 minutes. If the sample temperature is 30 °C (86 °F), wait 2 minutes.*



6. 타이머가 울린 후, Citric Acid Reagent Powder Pillow를 각 셀에 첨가하고 섞어준다.





7. 화면에 다음처럼 나타난다:

1:00 TIMER 2

ENTER키를 누른다.

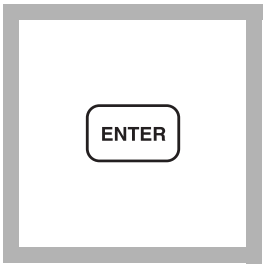
1분간의 반응시간이 시작된다. 이 시간 동안 Phosphate 방해 물질이 제거된다.

Note: *The time given is for samples at 20 °C (68 °F). If the sample temperature is 10 °C (50 °F), wait two minutes. If the sample is 30 °C (86 °F), wait 30 seconds.*

8. 타이머가 울린 후, Amino Acid F Reagent Powder Pillow를 한 셀에만 첨가하고 섞어준다. (the prepared sample)

Note: *The sample cell without the Amino Acid F Reagent is the blank.*

* Adapted from *Standard Methods for the Examination of Water and Wastewater.*



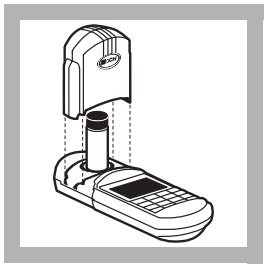
9. 화면에 다음처럼 나타난다:

2:00 TIMER 3

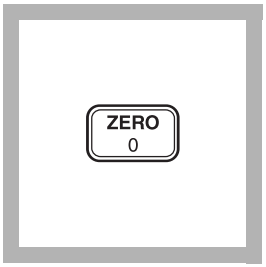
ENTER키를 누른다.

2분간의 반응 시간이 시작된다.

Note: *A blue color will develop if silica is present.*



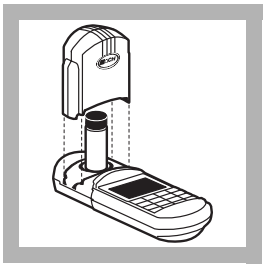
10. 타이머가 울린 후, blank (Amino Acid F Reagent를 첨가하지 않은 샘플셀)을 셀 홀더에 넣고 기기 덮개를 덮는다.



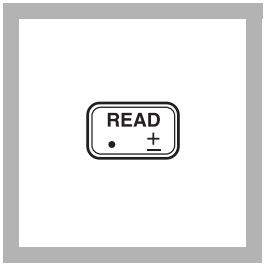
11. ZERO키를 누른다.

화면에 다음과 같이 나타난다:

0.00 mg/L SiO2



12. 측정할 샘플셀을 셀 홀더에 넣고 기기 덮개를 덮는다.



13. READ키를 누른다.

화면에 결과치가 mg/L SiO2로 나타난다.

Note: *Use of the Standard Adjust feature with each new lot of reagent is highly recommended. See Accuracy Check.*

REQUIRED REAGENTS

	Cat. No.
Low Range Silica Reagent Set, 10 mL sample (100 tests)	24593-00
Includes: (1) 22540-69, (1) 21062-69 (2) 1995-26	

Description	Quantity Required Per Test	Units	Cat. No.
Amino Acid F Reagent Powder Pillows	1 pillow	100/pkg	22540-69
Citric Acid Powder Pillows	2 pillows	100/pkg	21062-69
Molybdate 3 Reagent	28 drops	50 mL SCDB	1995-26

REQUIRED APPARATUS

Sample Cell, 10-20-25 mL, w/ cap	2	6/pkg	24019-06

OPTIONAL REAGENTS

Silica Standard Solution, 1.00 mg/L SiO_2	500 mL	1106-49
Silica Standard Solution, 25 mg/L SiO_2	236 mL	21225-31
Sodium Bicarbonate, ACS	454 g	776-01
Sodium Hydroxide Standard Solution, 1.000 N	900 mL	1045-53
Sulfuric Acid Standard Solution, 1.0 N	1000 mL	1270-53

OPTIONAL APPARATUS

Bottle, 118 mL, polyethylene, oblong	6/pkg	23184-06
Dropper, 0.5- & 1.0-mL marks	6/pkg	23185-06
Pipet, serological, 2 mL, poly	each	2106-36
Pipet, TenSette, 0.1 to 1.0 mL	each	19700-01
Pipet Tips, for 19700-01 Pipet	50/pkg	21856-96
Pipet Tips, for 19700-01 Pipet	1000/pkg	21856-28
Standard Methods for the Examination of Water and Wastewater	each	22708-00
Thermometer, - 20 to 110 °C, Non-Mercury	each	26357-02

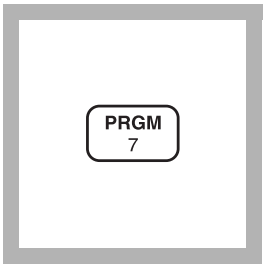
For Technical Assistance, Price and Ordering

In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

SILICA, High Range (0 to 75.0 mg/L)

Silicomolybdate Method



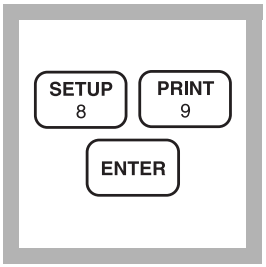
1. 다음 항목의 측정을 위해 번호를 선택한다: high range silica (SiO_2).

Press: **PRGM**

The display will show:

PRGM ?

Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*



2. 89번을 선택하고 **ENTER.** 화면에 **mg/L, SiO2**와 **ZERO** 아이콘이 나타난다.

Note: *For alternate form (Si), press the* **CONC** *key.*

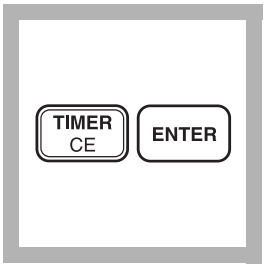
3. 샘플셀 두개에 샘플 10mL씩 채운다. 둘 중 하나를 blank로 설정하고 따로 둔다.

Note: *Sample temperature should be 15 to 25 °C (59 to 77 °F).*

4. 나머지 한 셀에 Molybdate Reagent Powder Pillow for High Range Silica를 첨가한다. (the prepared sample) 뚜껑을 닫고 뒤집어서 섞어준다.

5. 같은 셀에 Acid Reagent Powder Pillow for High Range Silica를 첨가하고 섞어준다.

Note: *Silica or phosphate will cause a yellow color to develop.*



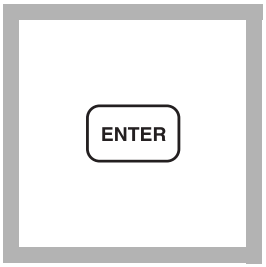
6. 다음 버튼을 누른다:

TIMER ENTER

10분간의 반응 시간이 시작된다.

7. 타이머가 울린 후, Citric Acid Powder Pillow를 첨가하고 섞어준다.

Note: *The yellow color due to phosphate will disappear.*

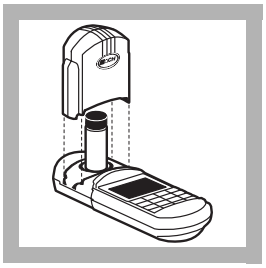


8. The display will show: **2:00 Timer 2**

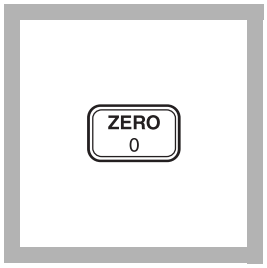
Press: **ENTER**

A two-minute reaction period will begin.

Note: *Perform Steps 9-12 within three minutes after the timer beeps.*



9. 타이머가 울린 후, blank를 셀 홀더에 넣고 기기 덮개를 덮는다.

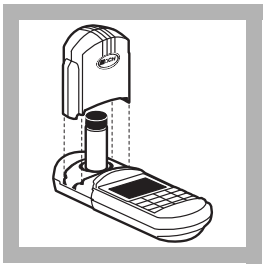


10. **ZERO**키를 누른다.

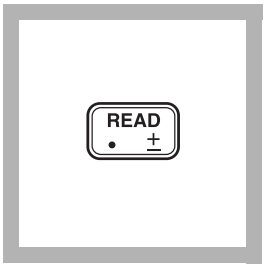
화면에 다음처럼 나타난다:

0.0 mg/L SiO2

Note: *If Reagent Blank Correction is on, the display may flash "limit". See Section 1.*



11. 전처리된 샘플셀을 셀 홀더에 넣고 기기 덮개를 덮는다.



12. **READ**키를 누른다.

화면에 결과치가 mg/L silica (SiO_2)로 나타난다.

Note: *Use of the Standard Adjust feature with each new lot of reagent is highly recommended. See Accuracy Check.*

REQUIRED REAGENTS

	Cat. No.
High Range Silica Reagent Set, 10-mL sample (100 tests)	24296-00
Includes: (1) 21074-69, (1) 21062-69, (1) 21073-69	

Description	Quantity Required Per Test	Units	Cat. No.
Acid Reagent Powder Pillows for High Range Silica	1	100/pkg	21074-69
Citric Acid Powder Pillows	1	100/pkg	21062-69
Molybdate Reagent Powder Pillows for HR Silica	1	100/pkg	21073-69

REQUIRED APPARATUS

Sample Cell, 10-20-25 mL, w/ cap	2	6/pkg	24019-06

OPTIONAL REAGENTS

Silica Standard Solution, 10 mg/L	500 mL	1403-49
Silica Standard Solution, 25 mg/L	236 mL	21225-31
Silica Standard Solution, 50 mg/L	200 mL	1117-29
Silica Standard Solution, 1000 mg/L	500 mL	194-49
Sodium Bicarbonate, ACS	454 g	776-01
Sulfuric Acid Standard Solution, 1.000 N	100 mL MDB	1270-32
Water, deionized	4 L	272-56

OPTIONAL APPARATUS

Pipet, TenSette, 0.1 to 1.0 mL	each	19700-01
Pipet Tips, for 19700-01 Pipet	50/pkg	21856-96
Pipet Tips, for 19700-01 Pipet	1000/pkg	21856-28
Standard Methods for the Examination of Water and Wastewater	each	22708-00
Thermometer, -20 to 110 ˚C, Non-Mercury	each	26357-02

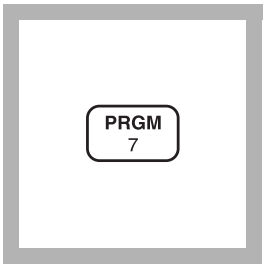
For Technical Assistance, Price and Ordering

In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

SILICA, Ultra High Range (0 to 200 mg/L)

Silicomolybdate Method



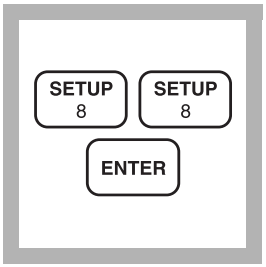
1. 다음 항목의 측정을 위해 번호를 선택한다: ultra high range silica (SiO_2).

Press: **PRGM**

The display will show:

PRGM ?

Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*

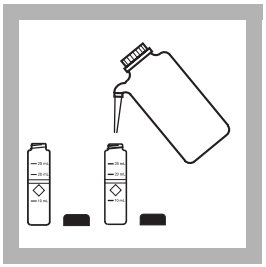


2. 88번을 선택하고 **ENTER.** 화면에 **mg/L, SiO2**와 **ZERO** 아이콘이 나타난다.

Note: *For alternate form (Si), press the* **CONC** *key.*

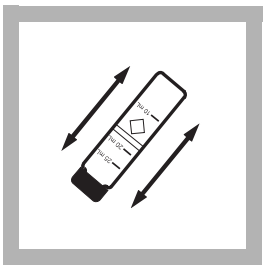
3. 샘플셀 두개에 샘플을 10mL선 까지 채운다.

Note: *Sample temperature should be 15 to 25 °C (59 to 77 °F).*



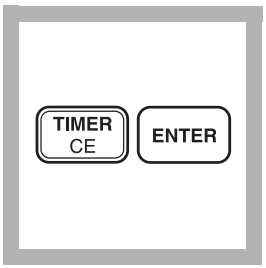
4. 각 샘플셀에 25mL 선까지 증류수를 채운다. 둘중에 하나를 blank로 설정하고 한쪽에 따로 둔다.

5. 남은 샘플셀에 Molybdate Reagent Powder Pillow for High Range Silica를 첨가하고 섞어준다. (the prepared sample)



6. 같은 샘플셀에 Acid Reagent Powder Pillow for High Range Silica를 첨가하고 섞어준다.

Note: *Silica or phosphate will cause a yellow color to develop.*



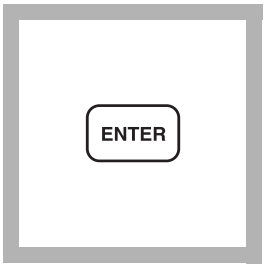
7. 다음 버튼을 누른다:

TIMER ENTER

10분간의 반응시간이 시작된다.

8. 타이머가 울린 후, Citric Acid Powder Pillow를 첨가하고 섞어준다.

Note: *The yellow color due to phosphate will disappear.*

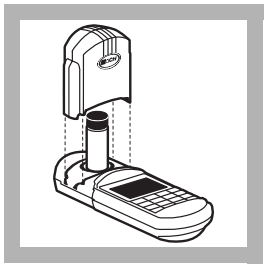


9. 화면에 다음처럼 나타난다: **2:00 Timer 2**

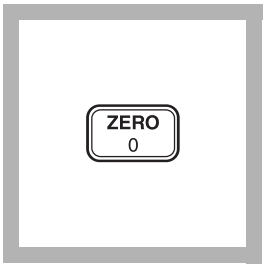
ENTER키를 누른다.

2분간의 반응 시간이 시작된다.

Note: *Perform Steps 10-13 within three minutes after the timer beeps.*



10. 타이머가 울린 후, blank를 셀 홀더에 넣고 기기 덮개를 덮는다.

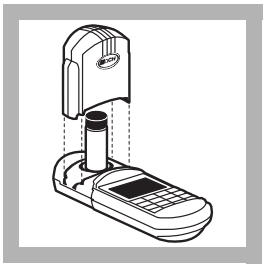


11. ZERO키를 누른다.

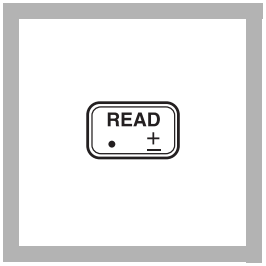
화면에 다음과 같이 나타난다:

0 mg/L SiO2

Note: *If Reagent Blank Correction is on, the display may flash "limit". See Section 1.*



12. 전처리된 샘플을 셀 홀더에 넣고 기기 덮개를 덮는다.



13. READ키를 누른다.

화면에 결과치가 mg/L silica (SiO_2)로 나타난다.

Note: *Use of the Standard Adjust feature with each new lot of reagent is highly recommended. See Accuracy Check.*

REQUIRED REAGENTS

	Cat. No.
High Range Silica Reagent Set, 25-mL sample (100 tests)	22443-00

Includes: (1) 1042-99, (1) 14548-99, (1) 1041-99

Description	Quantity Required Per Test	Units	Cat. No.
Acid Reagent Powder Pillows for High Range Silica	1	100/pkg	1042-99
Citric Acid Powder Pillows	1	100/pkg	14548-99
Molybdate Reagent Powder Pillows for HR Silica	1	100/pkg	1041-99
Water, deionized	30 mL	4 L	272-56

REQUIRED APPARATUS

Sample 10-20-15 mL, w/ cap	2	6/pkg	24019-06

OPTIONAL REAGENTS

Silica Standard Solution, 10 mg/L	500 mL	1403-49
Silica Standard Solution, 25 mg/L	236 mL	21225-31
Silica Standard Solution, 50 mg/L	200 mL	1117-29
Silica Standard Solution, 1000 mg/L	500 mL	194-49
Sodium Bicarbonate, ACS	454 g	776-01
Sulfuric Acid Standard Solution, 1.000 N	100 mL MDB	1270-32

OPTIONAL APPARATUS

Flask, volumetric, 250 mL, Class A	each	14574-46
Pipet, TenSette, 0.1 to 1.0 mL	each	19700-01
Pipet Tips, for 19700-01 Pipet	50/pkg	21856-96
Pipet, volumetric, Class A, 100 mL	each	14515-42
Pipet Filler, safety bulb	each	14651-00
Standard Methods for the Examination of Water and Wastewater	each	22708-00
Thermometer, -20 to 110 °C, Non-Mercury	each	26357-02

For Technical Assistance, Price and Ordering

In the U.S.A.—Call 800-227-4224

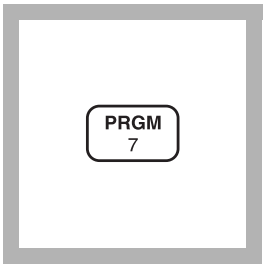
Outside the U.S.A.—Contact the Hach office or distributor serving you.

SULFATE (0 to 70 mg/L)

SulfaVer 4 Method* (Powder Pillows or AccuVac Ampuls); USEPA accepted for reporting wastewater analysis**

Using Powder Pillows

1. 정확한 값을 위해서 User-Entered Calibration 이 필요하다. 이 실험의 항목 뒤에 첨부된 *User Calibration* section 을 참조하도록 한다. 높은 정밀도가 필요하지 않다면 Program 91번을 사용하면 된다.

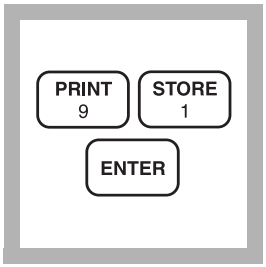


2. 다음 항목의 측정을 위해 번호를 선택한다: sulfate (SO_4^-).

Press: **PRGM**

The display will show:

PRGM ?



3. **91**번을 선택하고 **ENTER,** 또는 user-entered calibration으로 지정한 번호를 선택.

화면에 **mg/L, SO4**와 **ZERO** 아이콘이 표시된다.

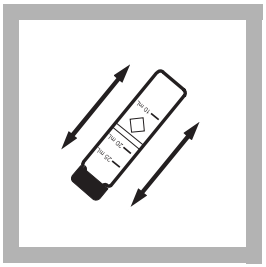
4. 깨끗한 샘플셀에 샘플 10mL을 채운다.

Note: *Filter highly turbid or colored samples. Use filtered sample in this step and as the blank.*

Note: *The nature of turbidimetric tests and reagent lot variation requires user calibration for best results.*

* Adapted from *Standard Methods for the Examination of Water and Wastewater.*

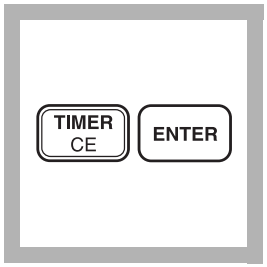
** Procedure is equivalent to USEPA method 375.4 for wastewater.



5. SulfaVer 4 Sulfate Reagent Powder Pillow 를 셀에 첨가하고 여러번 뒤집어서 섞어 준다. (the prepared sample)

Note: *A white turbidity will develop if sulfate is present in the sample.*

Note: *Accuracy is not affected by undissolved powder.*

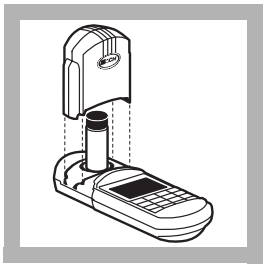


6. 다음 버튼을 누른다:

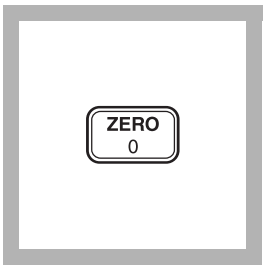
TIMER ENTER

5분간의 반응시간이 시작된다. 셀을 안정되게 놓아둔다.

7. 타이머가 울린 후, 두번째 샘플셀에 샘플 10mL을 채운다. (the blank)



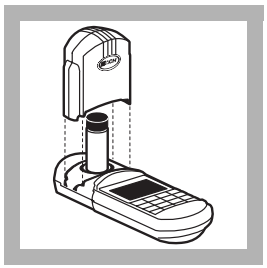
8. blank를 셀 홀더에 넣고 기기 덮개를 덮는다.



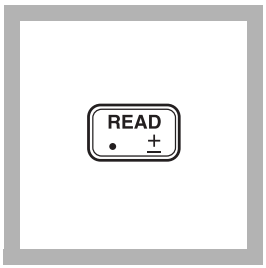
9. ZERO키를 누른다.

화면에 다음처럼 나타난다:

0 mg/L SO4



10. 타이머가 울린 후, 5분안에 전처리된 샘플 셀을 셀 홀더에 넣고 기기 덮개를 덮는다.



11. READ키를 누른다.

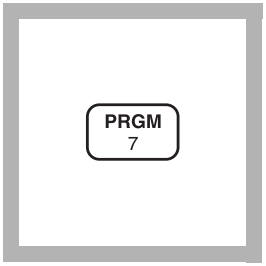
화면에 결과치가 mg/L sulfate로 나타난다.

Note: *If Program 91 is used, use of the Standard Adjust is highly recommended. See Accuracy Check.*

Note: *Clean the sample cells with soap and a brush.*

Using AccuVac Ampuls

1. 정확한 값을 위해서 User-Entered Calibration 이 필요하다. 이 실험의 항목 뒤에 첨부된 User Calibration Section 을 참조하도록 한다. 높은 정밀도가 필요하지 않다면 Program 92을 사용하면 된다.

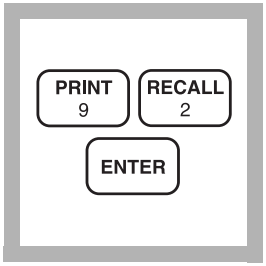


2. 다음 항목의 측정을 위해 번호를 선택한다:
sulfate (SO_4^-)-AccuVac Ampuls.

Press: **PRGM**

The display will show:

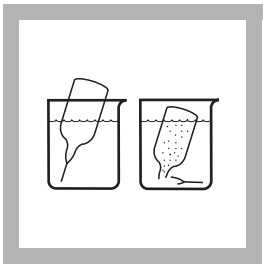
PRGM ?



3. 92번을 선택하고 **ENTER.** 화면에 **mg/L, SO4**와 **ZERO** 아이콘이 나타난다.

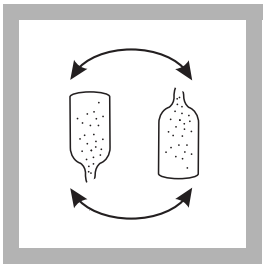
4. 샘플셀에 샘플을 10mL 이상 채운다. (the blank) 비커에 샘플을 50mL이상 채운다.

Note: *Filter highly turbid or colored samples. Use filtered sample in this step and as the blank.*



5. SulfaVer 4 Sulfate AccuVac Ampul에 샘플을 채운다.

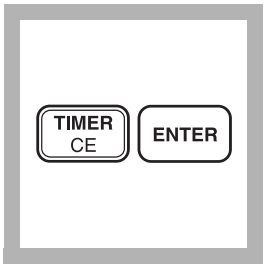
Note: *Keep tip immersed until the ampul fills completely.*



6. 앰퓰을 빠르게 여러번 뒤집어서 섞어준다. 앰퓰의 표면을 깨끗이 닦는다.

Note: *A white turbidity will develop if sulfate is present.*

Note: *Accuracy is not affected by undissolved powder.*

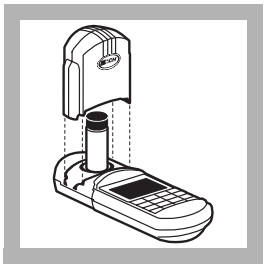


7. 다음 버튼을 누른다:

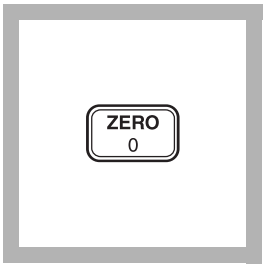
TIMER ENTER

5분간의 반응시간이 시작된다.

Note: *Allow the ampul to stand undisturbed.*



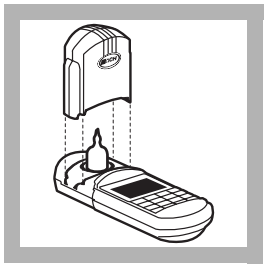
8. 타이머가 울린 후, blank를 셀 홀더에 넣고 기기 덮개를 덮는다.



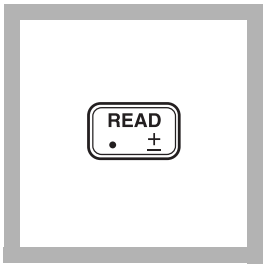
9. ZERO키를 누른다.

화면에 다음과 같이 나타난다:

0 mg/L SO4



10. 타이머가 울린 후 5분안에 앰퓰을 셀 홀더에 넣고 기기 덮개를 덮는다.



11. READ키를 누른다.

화면에 결과치가 mg/L sulfate로 나타난다.

Note: *If Program 92 is used, use of the Standard Adjust is highly recommended. See Accuracy Check.*

REQUIRED REAGENTS AND APPARATUS (Using Powder Pillows)

Description	Quantity Required Per Test	Units	Cat. No.
SulfaVer 4 Sulfate Reagent Powder Pillows	1 pillow	100/pkg	21067-69
Sample Cell, 10-20-25 mL, w/ cap	2	6/pkg	24019-06

REQUIRED REAGENTS AND APPARATUS (Using AccuVac Ampuls)

SulfaVer 4 Sulfate AccuVac Ampuls	1 ampul	25/pkg	25090-25
Beaker, 50-mL	1	each	500-41H

OPTIONAL REAGENTS

Standard, Drinking Water Inorganics, F^-, NO_3^{-N}, PO_4^{-3}, SO_4^{-2}	500 mL	28330-49
Standard, Wastewater Effluent Inorganics, NH_3^{-N}, NO_3^{-N}, PO_4^{-3}, COD, SO_4^{-2}, TOC	500 mL	28332-49
Sulfate Standard Solution, 50 mg/L	500 mL	2578-49
Sulfate Standard Solution, 1000 mg/L	500 mL	21757-49
Sulfate Standard Solution, PourRite Ampule, 2500 mg/L, 10 mL	16/pkg	14252-10
Sulfate Standard Solution, PourRite Ampule, 1000 mg/L, 2 mL	20/pkg	21757-20
Water, deionized	4 L	272-56

OPTIONAL APPARATUS

AccuVac Snapper Kit	each	24052-00
Cylinder, graduated mixing, 25 mL	each	20886-40
Filter Paper, folded, 12.5 cm	100/pkg	1894-57
Flask, volumetric, 50 mL, Class A	each	14574-41
Funnel, poly, 65 mm	each	1083-67
Pipet, TenSette, 0.1 to 1.0 mL	each	19700-01
Pipet Tips, for 19700-01 Pipet	50/pkg	21856-96
Pipet, volumetric, 1.00 mL, Class A	each	14515-35
Pipet, volumetric, 2.00 mL, Class A	each	14515-36
Pipet, volumetric, 3.00 mL, Class A	each	14515-03
Pipet, volumetric, 4.00 mL, Class A	each	14515-04
Pipet, volumetric, 5.00 mL, Class A	each	14515-37
Pipet, volumetric, 6.00 mL, Class A	each	14515-06
Pipet, volumetric, 7.00 mL, Class A	each	14515-07
Pipet Filler, safety bulb	each	14651-00
PourRite Ampule Breaker	each	24846-00

For Technical Assistance, Price and Ordering

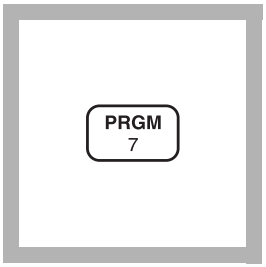
In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

SULFIDE (0 to 0.70 mg/L S^{2-})

For water, wastewater and seawater

Methylene Blue Method* USEPA accepted for reporting wastewater analysis**

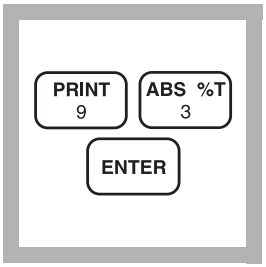


1. sulfide (S)의 측정 번호를 선택한다.

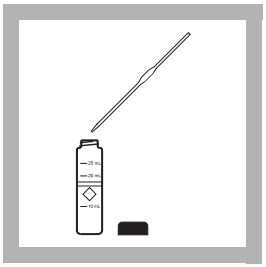
Press: **PRGM**

The display will show:

PRGM ?



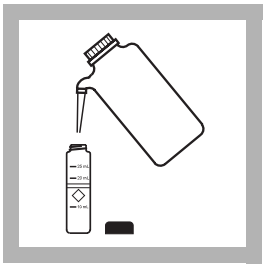
2. 93번을 선택하고 **ENTER.** 화면에 **mg/L, S**와 **ZERO** 아이콘이 나타난다.



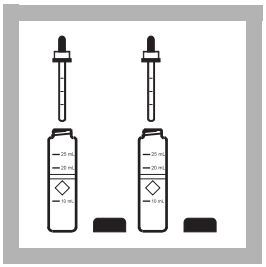
3. 깨끗한 샘플셀에 샘플 25mL을 담는다. (the prepared sample)

Note: *Samples must be analyzed immediately and cannot be preserved for later analysis. Use a pipet to avoid agitation.*

Note: *For field testing, a 25-mL graduated cylinder may be used.*

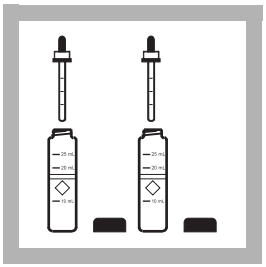


4. 두번째 샘플셀에 증류수를 25mL 담는다. (the blank)



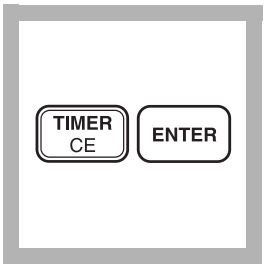
5. Sulfide 1 Reagent를 각 셀에 1.0mL씩 첨가하고 섞어준다.

Note: *Use the calibrated 1-mL dropper.*



6. Sulfide 2 Reagent를 각 셀에 1.0mL씩 첨가하고 즉시 섞어준다.

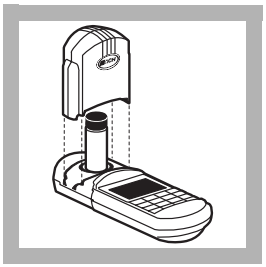
Note: *A pink color will develop, then the solution will turn blue if sulfide is present.*



7. 다음 버튼을 누른다:

TIMER ENTER

5분간의 반응 시간이 시작된다.



8. blank를 셀 홀더에 넣고 기기 덮개를 덮어준다.

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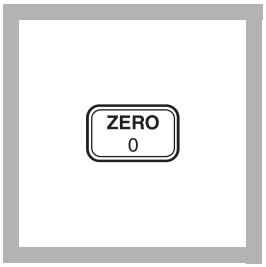
* Adapted from *Standard Methods for the Examination of Water and Wastewater.*

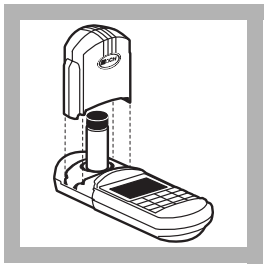
** Procedure is equivalent to USEPA method 376.2 or Standard Method 4500-S^{2-} D for wastewater.



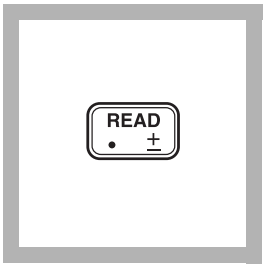
9. ZERO키를 누른다.

화면에 다음과 같이 나타난다:

0.00 mg/L S



10. 타이머가 울린 후, 측정할 샘플을 셀 홀더에 넣고 기기 덮개를 덮는다.



11. READ키를 누른다.

화면에 결과치가 mg/L sulfide로 나타난다.

Note: *Some sulfide loss may occur if dilution is necessary.*

Note: *Standard Adjust may be performed using a prepared standard (see Standard Adjust in Section 1).*

REQUIRED REAGENTS

	Cat. No.
Sulfide Reagent Set (100 tests)	22445-00
Includes: (2) 1816-42, (2) 1817-42	

Description	Quantity Required Per Test	Units	Cat. No.
Sulfide 1 Reagent	2 mL	100 mL MDB	1816-32
Sulfide 2 Reagent	2 mL	100 mL MDB	1817-32
Water, deionized	25 mL	4 L	272-56

REQUIRED APPARATUS

Cylinder, graduated, 25 mL	1	each	508-40
Pipet, volumetric, Class A, 25.00 mL	1	each	14515-40
Pipet Filler, safety bulb	1	each	14651-00
Sample Cell, 10-20-25 mL, w/ cap	2	6/pkg	24019-06

OPTIONAL REAGENTS

Description	Units	Cat. No.
Bromine Water, 30 g/L	29 mL	2211-20
Phenol Solution, 30 g/L	29 mL	2112-20
Sodium Sulfide, hydrate	114 g	785-14

OPTIONAL APPARATUS

Bottle, Wash, 250 mL	each	620-31
Dropper, for 1 oz. bottle	each	2258-00
Flask, erlenmeyer, 50 mL	each	505-41
Standard Methods for the Examination of Water and Wastewater	each	22708-00

For Technical Assistance, Price and Ordering

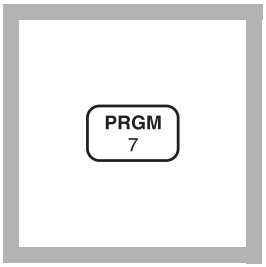
In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

SURFACTANTS, ANIONIC (0 to 0.300 mg/L)

For water, wastewater, and seawater

(Also called: Detergents) Crystal Violet Method*

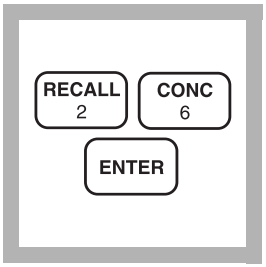


1. Surfactants, anionic (LAS) 항목의 측정을 위해서 번호를 선택한다.

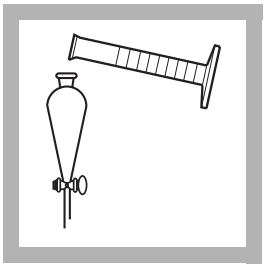
Press: **PRGM**

The display will show:

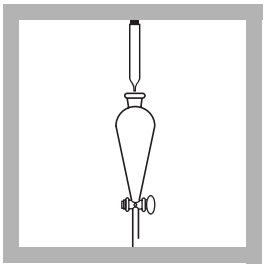
PRGM ?



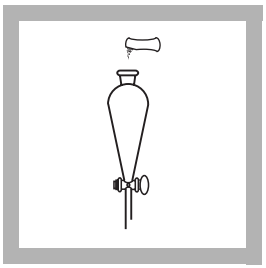
2. 26번을 선택하고 **ENTER.** 화면에 **mg/L, LAS**와 **ZERO** 아이콘이 나타난다.



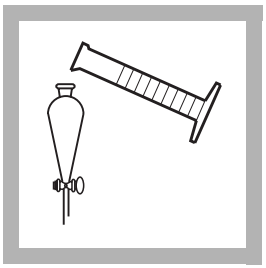
3. 깨끗한 500mL 눈금 실린더에 샘플 300mL을 채운다. 이 샘플을 500mL 분별 깔대기에 옮겨 담는다.



4. 깔대기에 Sulfate Buffer Solution을 10mL 첨가한다.깔대기의 마게를 닫고 5초간 흔들어준다.



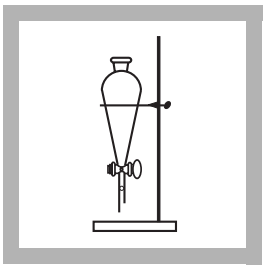
5. Detergents Reagent Powder Pillow를 첨가하고 뚜껑을 닫은 후 흔들어서 용해 시킨다.



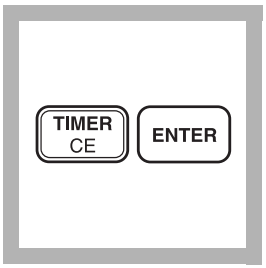
6. 30mL의 벤젠을 첨가하고 부드럽게 1분간 흔들어준다.

Note: *Spilled reagent will affect test accuracy and is hazardous to the skin and other materials.*

Note: *Use benzene only in a well-ventilated area.*



7. 분별 깔대기를 스탠드에 세워둔다.



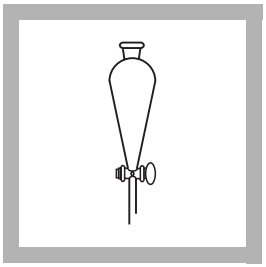
8. 다음 버튼을 누른다:

TIMER ENTER

30분의 반응 시간이 시작된다.

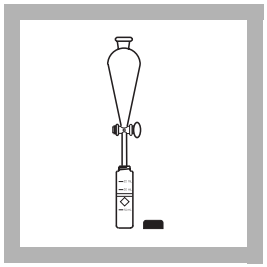
Note: *Excessive agitation may cause an emulsion, requiring a longer time for phase separation. If this occurs, remove most of the water layer, then gently agitate the funnel with a clean inert object in the funnel such as a Teflon-coated magnetic stirring bar.*

* *Analytical Chemistry*, 38, 791(1966).



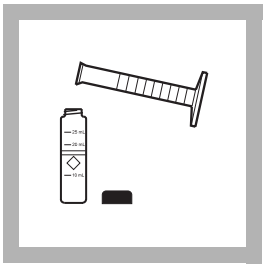
9. 타이머가 울린 후, 뚜껑을 제거하고 아래 쪽에 층이 져 있는 물을 빼낸다. 빼낸 물은 폐기한다.

Note: *Benzene solutions are a regulated waste and cannot be poured down the drain. See Section 3 for proper disposal of these materials.*

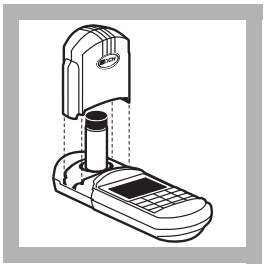


10. 위쪽의 벤젠층을 깨끗한 샘플셀로 옮겨 담는다. (the prepared sample).

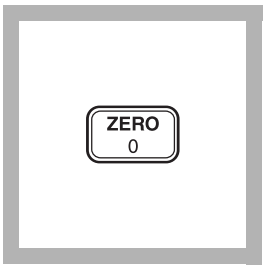
Note: *The benzene layer cannot be filtered before color measurement. Filtration removes the blue color.*



11. 다른 샘플셀에 25mL 마크까지 순수한 벤젠을 담는다. (the blank)



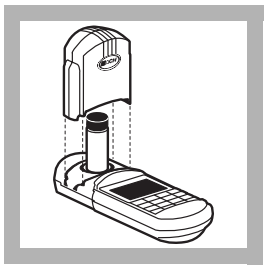
12. blank를 셀 홀더에 넣고 기기 덮개를 덮는다.



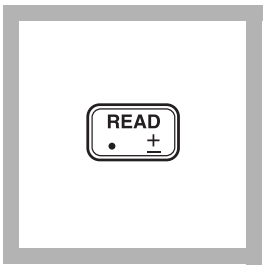
13. **ZERO**키를 누른다.

화면에 다음처럼 나타난다:

0.000 mg/L LAS



14. 측정할 샘플을 셀 홀더에 넣고 기기 덮개를 덮는다.



15. **READ**키를 누른다.

화면에 결과치가 mg/L anionic surfactants (LAS)로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Standard Adjust in Section 1).*

Note: *Acetone may be used to clean benzene from glassware.*

REQUIRED REAGENTS

Description	Quantity Required Per Test	Unit	Cat. No.
Benzene, ACS	55 mL	500 mL	14440-49
Buffer Solution, sulfate type	10 mL	500 mL	452-49
Detergent Reagent Powder Pillow	1 pillow	25/pkg	1008-68

REQUIRED APPARATUS

Clippers, for opening powder pillows	1	each	968-00
Cylinder, graduated, 25 mL	1	each	508-40
Cylinder, graduated, 50 mL	1	each	508-41
Cylinder, graduated, 500 mL	1	each	508-49
Funnel, separatory, 500 mL	1	each	520-49
Ring, support, 4 inch	1	each	580-01
Sample Cell, 10-20-25 mL, w/ cap	2	6/pkg	24019-06
Stand, support, 127 x 203 mm (5 x 8")	1	each	563-00

OPTIONAL REAGENTS

Acetone, ACS	500 mL	14429-49
Detergent Standard Solution, Voluette ampule, 60 mg/L as LAS, 10 mL	16/pkg	14271-10

OPTIONAL APPARATUS

Ampule Breaker Kit	each	21968-00
Pipet, TenSette, 0.1 to 1.0 mL	each	19700-01
Pipet Tips, for 19700-01 Pipet	50/pkg	21856-96
Pipet Tips, for 19700-01 Pipet	1000/pkg	21856-28
Thermometer, -20 to 110 °C, Non-Mercury	each	26357-02

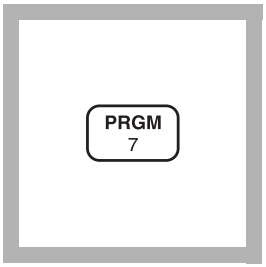
For Technical Assistance, Price and Ordering

In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

SUSPENDED SOLIDS (0 to 750 mg/L)

Photometric Method* (Also called Nonfilterable Residue)

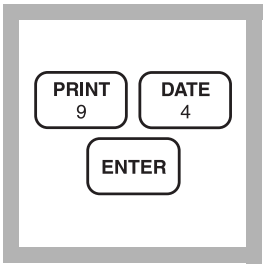


1. suspended solids 항목의 측정을 위해 번호를 선택한다.

Press: **PRGM**

The display will show:

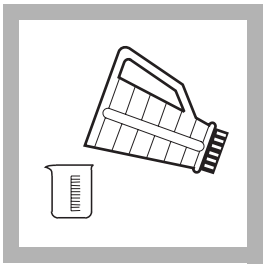
PRGM ?



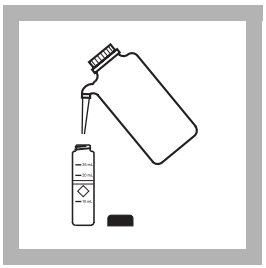
2. 94번을 선택하고

ENTER. 화면에 **mg/L, SuSld**와 **ZERO** 아이콘이 표시된다**.**

3. 500mL의 샘플을 혼합기에 넣고 고속으로 정확히 2분간 혼합한다.

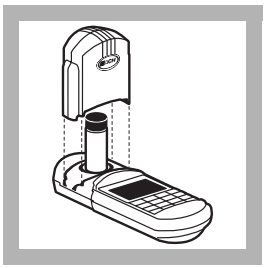


4. 혼합기의 샘플을 600mL 비커에 붓는다.

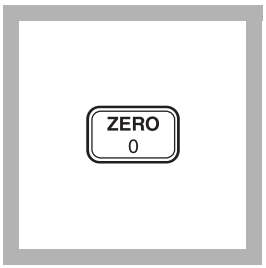


5. 샘플셀에 증류수를 25mL 채운다. (the blank)

Note: *Remove gas bubbles in the water by swirling or tapping the bottom of the cell on a table.*



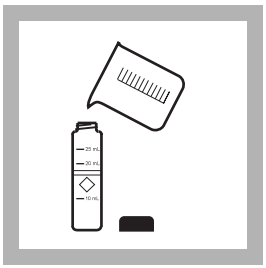
6. blank를 셀 홀더에 넣고 기기 덮개를 덮는다.



7. ZERO키를 누른다.

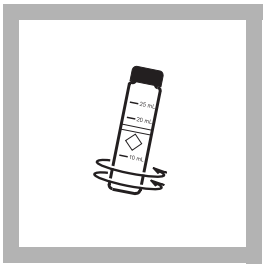
화면에 다음처럼 나타난다:

0 mg/L SuSld

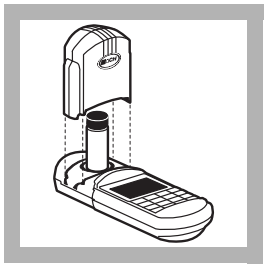


8. 혼합된 샘플을 잘 저어서 즉시 샘플셀에 25mL 채운다. (the prepared sample)

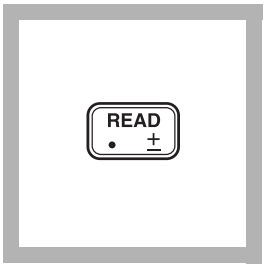
* Adapted from *Sewage and Industrial Wastes*, 31, 1159 (1959).



9. 샘플을 담은 셀을 섞어준 다음 공기방울이나 균질화 되지 않은 잔여물을 제거한다.



10. 측정할 샘플을 셀 홀더에 넣고 기기 덮개를 덮는다.



11. **READ**키를 누른다.

화면에 결과치가 mg/L suspended solids 로 나타난다.

REQUIRED APPARATUS

Description	Quantity Required Per Test	Unit	Cat. No.
Beaker, 600 mL, low form	1	each	1080-52
Blender, 1.2 L, 120 V	each	each	26161-00
Blender, 1.2 L, 240 V	each	each	26161-02
Cylinder, graduated, 500 mL, poly	1	each	1081-49
Pipet, serologic, 25 mL	1	each	2066-40
Pipet, Filler, safety bulb	1	each	14651-00

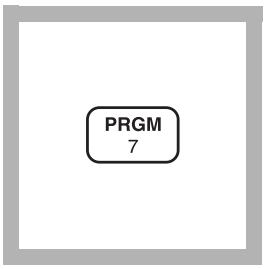
OPTIONAL APPARATUS

Stirring Rod, glass	3/pkg	1770-01
Wash Bottle, 250 mL	each	620-31

For Technical Assistance, Price and Ordering

In the U.S.A.—Call 800-227-4224
Outside the U.S.A.—Contact the Hach office or distributor serving you.

Tyrosine Method*

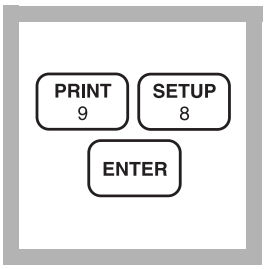


1. tannin and lignin의 측정을 위해 번호를 선택한다.

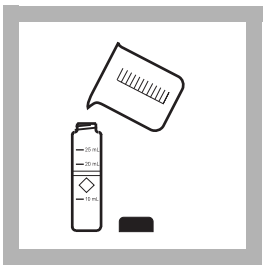
Press: **PRGM**

The display will show:

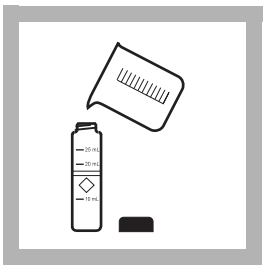
PRGM ?



2. 98번을 선택하고 **ENTER.** 화면에 **mg/L, tanic**과 **ZERO** 아이콘이 표시된다.

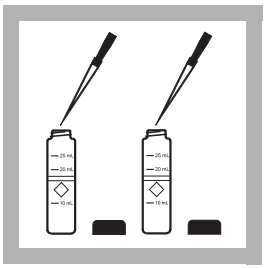


3. 샘플셀에 증류수를 25mL 채운다. (the blank)

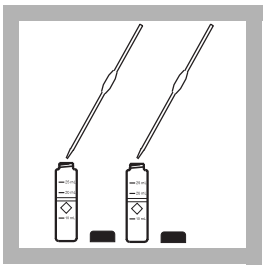


4. 다른 샘플셀에 샘플을 25mL 채운다. (the prepared sample)

Note: *Filter turbid samples and report results as mg/L soluble tannic acid.*

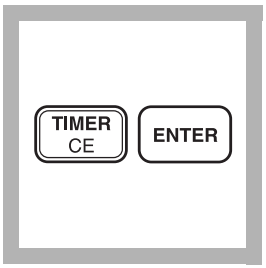


5. 0.5mL의 TanniVer 3 Tannin-Lignin Reagent를 각 셀에 첨가하고 섞어준다.



6. 5.0mL의 Sodium Carbonate Solution을 각 셀에 첨가하고 섞어준다.

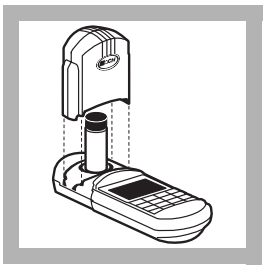
Note: *A blue color will develop if tannins and/or lignins are present.*



7. 다음 버튼을 누른다:

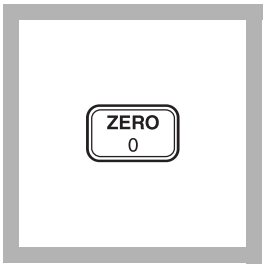
TIMER ENTER

25분간의 반응 시간이 시작된다.



8. 타이머가 울린 후, blank를 셀 홀더에 넣고 기기 덮개를 덮는다.

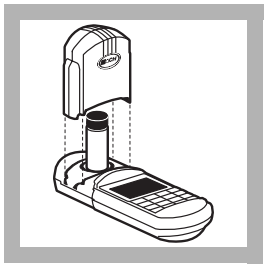
* Adapted from Kloster, M.B., *Journal American Water Works Association*, Vol. 66, No. 1, p. 44 (1974).



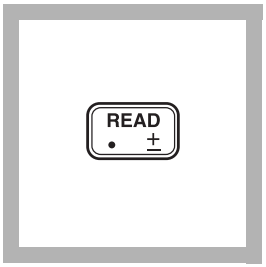
9. ZERO키를 누른다.

화면에 다음과 같이 나타난다:

0.0 mg/L tanic



10. 측정할 샘플을 셀 홀더에 넣고 기기 덮개를 덮는다.



11. READ키를 누른다.

화면에 결과치가 mg/L tannic acid로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Standard Adjust in Section 1).*

REQUIRED REAGENTS

	Cat. No.
Tannin and Lignin Reagent Set (up to 100 tests)	22446-00
Includes: (2) 675-49, (1) 2560-42	

Description	Quantity Required Per Test	Unit	Cat. No
Sodium Carbonate Solution	10 mL	500 mL	675-49
TanniVer 3 Tannin-Lignin Reagent	1 mL	100 mL	2560-42
Water, deionized	25 mL	4 L	272-56

REQUIRED APPARATUS

Pipet Filler, safety bulb	1	each	14651-00
Pipet, volumetric, Class A, 5.0 mL	1	each	14515-37
Pipet, volumetric, Class A, 0.5 mL	1	each	14515-34
Sample Cell, 10-20-25-mL, w/ cap	2	6/pkg	24019-06

OPTIONAL REAGENTS

Formaldehyde	100 mL	2059-32
Sodium Pyrophosphate, ACS	50 g	14295-25
Tannic Acid	113 g	791-14

OPTIONAL APPARATUS

Description	Unit	Cat. No
Balance, analytical, 115 V	each	28014-01
Balance, analytical, 230 V	each	28014-02
Cylinder, graduated, 25 mL	each	508-40
Filter Paper, folded, 12.5 cm	100/pkg	1894-57
Flask, volumetric, 1000 mL	each	14547-53
Funnel, poly, 65 mm	each	1083-67
Pipet, TenSette, 0.1 to 1.0 mL	each	19700-01
Pipet Tips, for 19700-01 Pipet	50/pkg	21856-96
Pipet Tips, for 19700-01 Pipet	1000/pkg	21856-28
Pipet, volumetric, Class A, 10.00 mL	each	14515-38
Pipet, Filler, safety bulb	each	14651-00
Spoon, measuring, 0.2 g	each	638-00
Weighing Boat, 67/47 mm	500/pkg	21790-00

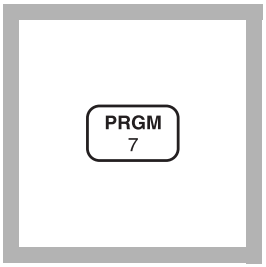
For Technical Assistance, Price and Ordering

In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

TURBIDITY (0 to 1000 FAU)

Absorptometric Method*



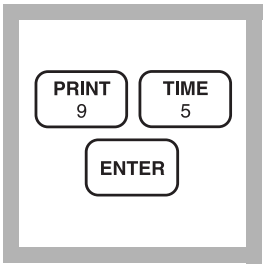
1. turbidity 항목의 측정을 위해 번호를 선택한다.

Press: **PRGM**

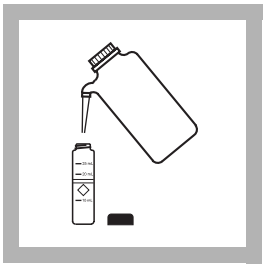
The display will show:

PRGM ?

Note:
1 FAU=1 NTU=1 FTU when measuring formazin. These are not equivalent when measuring other types of standards or samples.



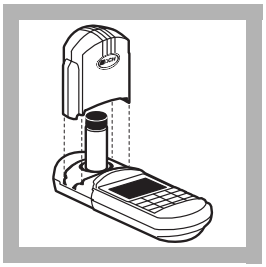
2. 95번을 선택하고 **ENTER.** 화면에 **FAU**와 **ZERO** 아이콘이 나타난다.



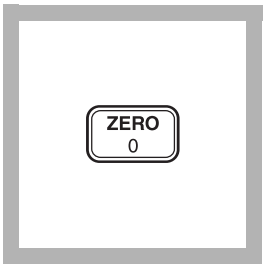
3. 샘플셀에 증류수를 10mL 채운다. (the blank)

Note: *Wipe the surface of the cell with a soft cloth.*

Note: *For highly colored samples, use a filtered portion of sample in place of the deionized water.*



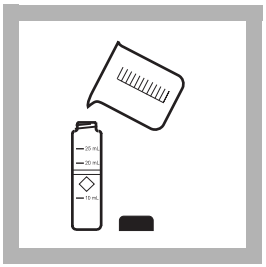
4. blank를 셀 홀더에 넣고 기기 덮개를 덮는다.



5. ZERO키를 누른다.

화면에 다음과 같이 나타난다:

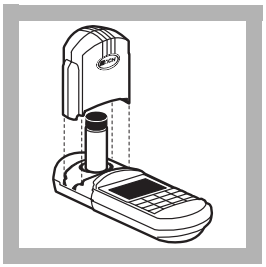
0 FAU



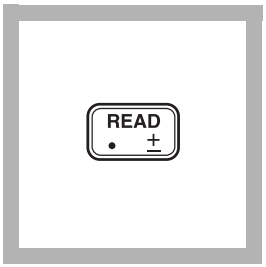
6. 다른 샘플셀에 샘플 10mL을 채운다.

Note: *Mix the sample well before transferring it to the sample cell.*

Note: *Wipe the surface of the cell with a soft cloth.*



7. 샘플을 담은 셀을 셀 홀더에 넣고 기기 덮개를 덮는다.



8. READ키를 누른다.

화면에 결과치가 Formazin Attenuation Units (FAU)으로 나타난다.

Note: *Standard Adjust may be performed using a prepared standard (see Section I).*

* Adapted from FWPCA *Methods for Chemical Analysis of Water and Wastes*, 275 (1969)

REQUIRED APPARATUS

Description	Quantity Required Per Test	Unit	Cat. No.
Sample Cell, 10-20-25 mL, w/cap	2	6/pkg	24019-06

REQUIRED REAGENTS

Description	Units	Cat. No.
Formazin Stock Solution, 4000 NTU	500 mL	2461-49
Silicone Oil	15 mL DB	1269-36
StablCal Stabilized Turbidity Standard, 200 NTU	500 mL	26604-49
Water, deionized	4 L	272-56

OPTIONAL APPARATUS

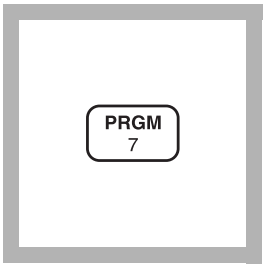
Description	Units	Cat. No.
Bath, ultrasonic	each	24895-00
Bottle, wash, 250 mL	each	620-31
Flask, volumetric, Class A, 100 mL	each	14574-42
Flask, filter, 500 mL	each	546-49
Filter Holder	each	13529-00
Filter Pump, aspirator	each	2131-00
Oiling cloth, for applying silicone oil	each	26873-00
Pipet Filler, safety bulb	each	14651-00
Pipet, volumetric, Class A, 5.0 mL	each	14515-37
Sample Degassing Kit	each	43975-00
Stopper, rubber, one-hole, No. 7	6/pkg	2119-07
Tubing, rubber, 5/16” I.D.	12 feet	560-19
Tweezers, plastic	each	14282-00

For Technical Assistance, Price and Ordering

In the U.S.A.—Call 800-227-4224
Outside the U.S.A.—Contact the Hach office or distributor serving you.

VOLATILE ACIDS (0 to 2800 as mg/L HOAc)

Esterification Method*



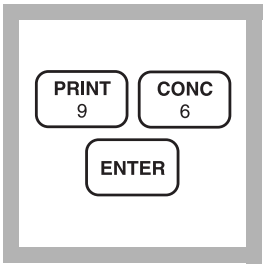
1. Volatile Acids as acetic acid (HOAc)의 측정을 위해서 번호를 선택한다.

Press: **PRGM**

The display will show:

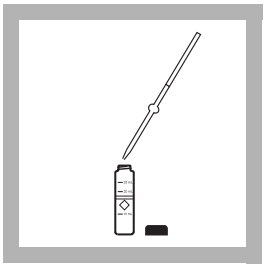
PRGM ?

Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*



2. 96번을 선택하고 **ENTER.** 화면에 **mg/L, HOAc**와 **ZERO** 아이콘이 나타난다.

Note: *If high levels of dissolved solids or mineral acids are present, distill as described in the Hach Distillation Apparatus manual.*



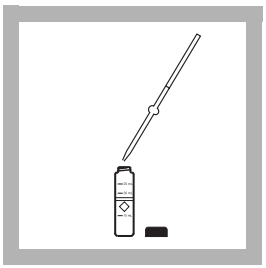
3. 0.5mL의 증류수를 잘 마른 25mL 샘플셀에 담는다. (the blank)

Note: *Use a Class A or TenSette Pipet.*

Note: *Adjust the pH of stored samples before analysis.*

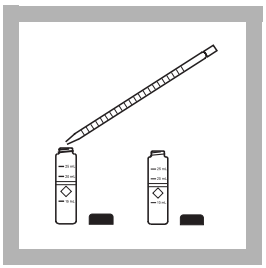
4. 샘플 25mL을 필터링하거나 원심분리한다.

Note: *Centrifugation is faster than filtration.*

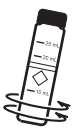


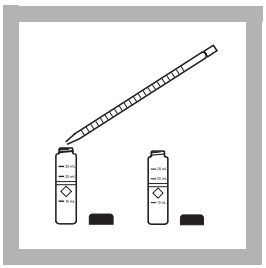
5. 0.5mL의 여과되거나 원심분리된 샘플을 다른 25mL 샘플셀에 옮겨담는다. (the prepared sample).

Note: *Use a Class A or TenSette Pipet.*

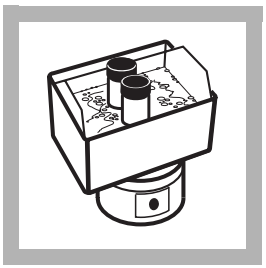


6. 1.5mL의 ethylene glycol을 각 셀에 첨가하고 섞어준다.





7. 0.2mL의 19.2 N Sulfuric Acid Standard Solution을 각 셀에 첨가하고 섞어준다.



8. 두 셀을 끓고있는 중탕기에 넣어 가열한다.

Note: *Samples may be boiled in a 600-mL beaker.*

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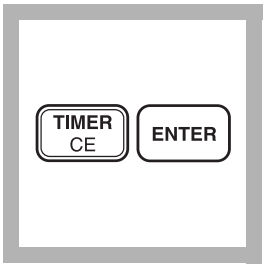
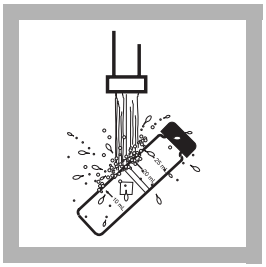
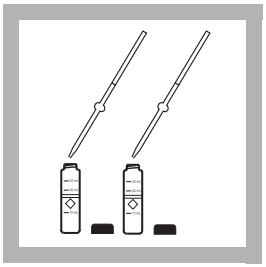
* Adapted from *The Analyst*, 87, 949 (1962)



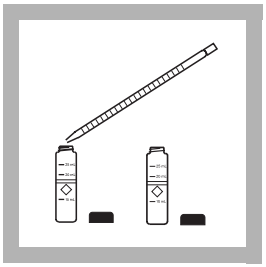
9. 다음 버튼을 누른다:
TIMER ENTER
3분간의 반응시간이 시작된다.



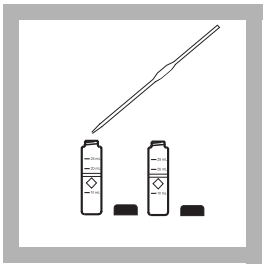
10. 타이머가 울린 후, 수돗물등을 사용해 셀을 25°C로 냉각시킨다. 식은 후 셀들을 잘 닦아 준다.



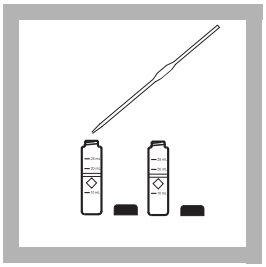
11. 0.5mL의 Hydroxylamine Hydrochloride Solution을 각 셀에 첨가하고 섞어준다.



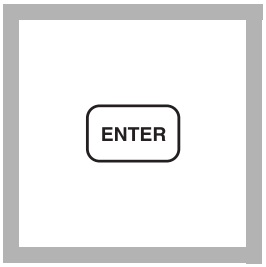
12. 2.0mL의 4.5 N Sodium Hydroxide Standard Solution을 각 셀에 첨가하고 섞어준다.



13. 10mL의 Ferric Chloride Sulfuric Acid Solution을 각 셀에 첨가하고 섞어준다.

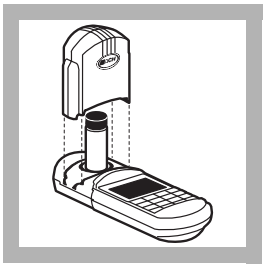


14. 10mL의 증류수를 각 셀에 첨가하고 섞어 준다.

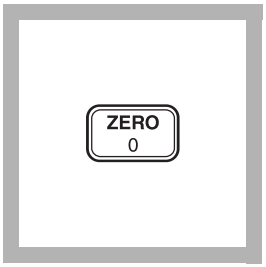


15. 화면에 다음처럼 표시: **3:00 TIMER 2**
ENTER키를 누른다.
3분간의 반응시간이 시작된다.

Note: *After this three-minute reaction period, proceed immediately through steps 16-19.*



16. 타이머가 울린 후 즉시, blank를 셀 홀더에 넣고 기기 덮개를 덮는다.

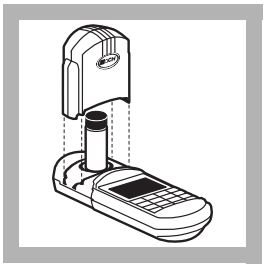


17. ZERO키를 누른다.

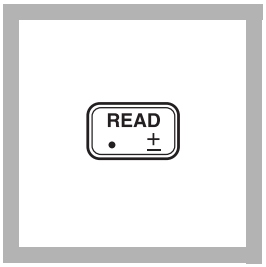
화면에 다음처럼 나타난다:

0 mg/L HOAc

Note: *If Reagent Blank Correction is on, the display may flash "limit". See Section 1.*



18. 측정할 샘플을 셀 홀더에 넣고 기기 덮개를 덮는다.



19. READ키를 누른다.

화면에 결과치가 mg/L Volatile Acids as acetic acid로 나타난다.

REQUIRED REAGENTS

	Cat. No.
Volatile Acids Reagent Set (90 tests)	22447-00
Includes: (1) 2039-53, (2) 2042-53, (1) 818-42, (1) 2040-53, (1) 2038-32	

Description	Quantity Required Per Test	Units	Cat. No.
Ethylene Glycol	3 mL	1000 mL	2039-53
Ferric Chloride-Sulfuric Acid Solution	20 mL	1000 mL	2042-53
Hydroxylamine Hydrochloride Solution, 100 g/L	1 mL	100 mL	818-42
Sodium Hydroxide Standard Solution, 4.5 N	4 mL	1000 mL	2040-53
Sulfuric Acid Standard Solution, 19.2 N	0.4 mL	100 mL	2038-32
Water, deionized	20.5 mL	4 L	272-56

REQUIRED APPARATUS

Description	Quantity Required Per Test	Units	Cat. No.
Cots, finger	2	2/pkg	14647-02
Cylinder, graduated, 10 mL	1	each	508-38
Filter Paper, folded, 12.5 cm	1	100/pkg	1894-57
Flask, erlenmeyer, 50 mL	1	each	505-41
Funnel, poly, 65 mm	1	each	1083-67
Hot Plate, circular, 3.5-inch diameter	1	each	12067-01
Pipet Filler, safety bulb	1	each	14651-00
Pipet, serological, 2 mL	2	each	532-36
Pipet, volumetric, Class A, 0.5 mL	3	each	14515-34
Pipet, volumetric, Class A, 10.00 mL	3	each	14515-38
Sample Cell, 10-20-25 mL, w/cap	2	6/pkg	24019-06
Water Bath and Rack	1	each	1955-55

OPTIONAL REAGENTS

Volatile Acids Standard Solution, PourRite ampule, 62,500 mg/L as acetic acid, 10 mL	16/pkg	14270-10

OPTIONAL APPARATUS

Ampule Breaker, PourRite	each	24846-00
Beaker, 600 mL	each	500-52
Bottle, wash, 500 mL	each	620-11
Centrifuge, laboratory, 115 Vac	each	26765-00
Centrifuge, laboratory, 230 Vac	each	26765-02
Centrifuge Tubes, 15 mL	10/pkg	22787-39
Centrifuge Tube Caps	20/pkg	25852-20
Cylinder, graduated, mixing, 25 mL	each	1896-40
Cylinder, graduated, plastic, 250 mL	each	1081-46
Distillation Apparatus	each	22653-00
Distillation Heater and Support Apparatus	each	22744-00
Flask, volumetric, Class A, 100 mL	each	14574-42
Pipet, TenSette, 0.1 to 1.0 mL	each	19700-01
Pipet Tips, for 19700-01 TenSette Pipet	50/pkg	21856-96
Pipet Tips, for 19700-01 TenSette Pipet	1000/pkg	21856-28
Pipet, TenSette, 1.0 to 10.0 mL	each	19700-10
Pipet Tips, for 19700-10	50/pkg	21997-96

For Technical Assistance, Price and Ordering

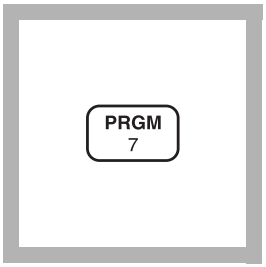
In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

ZINC (0 to 3.00 mg/L Zn)

For water and wastewater

Zincon Method* USEPA approved for wastewater analysis** (digestion needed; see Section 2)



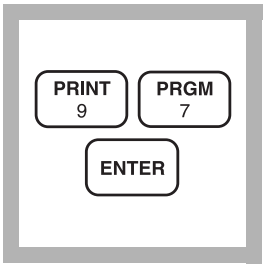
1. zinc (Zn) 항목의 측정을 위해 프로그램 번호를 선택한다.

Press: **PRGM**

The display will show:

PRGM ?

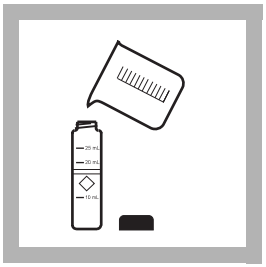
Note: *For most accurate results, perform a Reagent Blank Correction using deionized water (see Section 1).*



2. 97번을 선택하고 **ENTER.** 화면에 **mg/L, Zn**와 **ZERO** 아이콘에 표시된다.

Note: *Total zinc requires a prior digestion; use either the Digesdahl or mild digestion (Section 2).*

Note: *Adjust the sample to pH 4-5; see Sampling and Storage following these steps.*



3. 25mL 샘플셀에 샘플 20mL을 채운다.

Note: *Rinse glassware with 1:1 hydrochloric acid and deionized water before use.*

Note: *If samples cannot be analyzed immediately, see Sampling and Storage.*

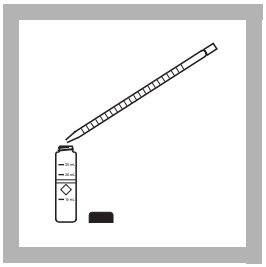
4. ZincoVer 5 Reagent Powder Pillow를 하나하나 첨가하고 뚜껑을 닫는다. 완전히 용해 시키 위해 여러차례 흔들어 준다. 만약 샘플이 오렌지 색으로 변하지 않는다면 아래의 Note를 참조한다.

Note: *Powder must be completely dissolved or inconsistent results may occur.*

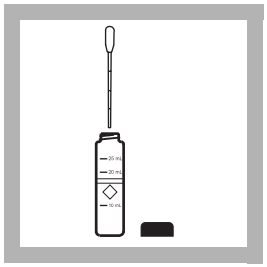
Note: *The sample should be orange. If it is brown or blue, dilute the sample and repeat the test. Either the zinc concentration is too high or an interference is present.*

Caution: **ZincoVer 5 contains cyanide and is very poisonous if taken internally or inhaled. Do not add to an acidic sample. Store away from water and acids.**

* Adapted from *Standard Methods for the Examination of Water and Wastewater.*
** *Federal Register*, 45 (105) 36166 (May 29, 1980).

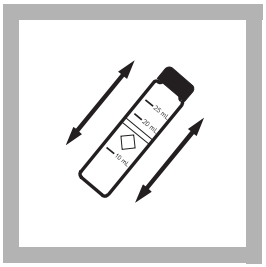


5. 오렌지 색으로 변한 용액을 다른 샘플셀로 10mL 옮겨담는다.
(the blank)



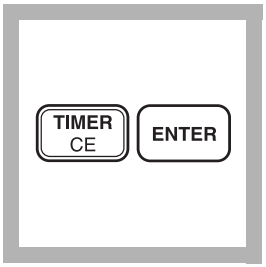
6. 옮겨담고 남은 샘플에 0.5mL의 cyclohexanone을 첨가한다.
(the prepared sample)

Note: *Use a plastic squeezer. Rubber bulbs may contaminate the cyclohexanone.*



7. 첨가한 셀을 뚜껑을 닫고 30초간 매우 세게 흔들어준다. (the prepared sample)

Note: *The sample will be red-orange, brown or blue, depending on the zinc concentration.*

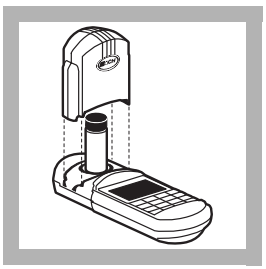


8. 다음 버튼을 누른다:

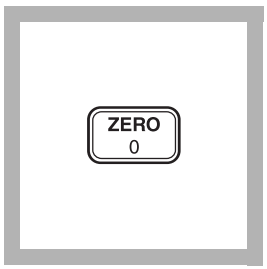
TIMER ENTER

3분간의 반응시간이 시작된다.

Note: *Steps 9-11 must be completed within 10 minutes after the timer beeps.*



9. blank를 셀 홀더에 넣고 기기 덮개를 덮는다.

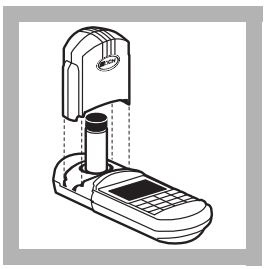


10. **ZERO**키를 누른다.

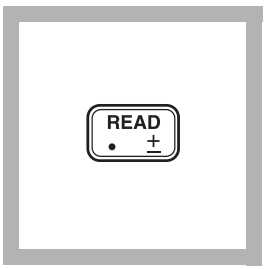
화면에 다음과 같이 나타난다:

0.00 mg/L Zn

Note: *If Reagent Blank Correction is on, the display may flash "limit". See Section 1.*



11. 즉시 측정할 셀을 셀 홀더에 넣고 기기 덮개를 덮는다.



12. **READ**키를 누른다.

화면에 결과치가 mg/L Zn로 나타난다.

Note: *Standard Adjust may be performed using a prepared 0.50 mg/L standard. See Section 1.*

REQUIRED REAGENTS

Zinc Reagent Set, 20 mL size (100 tests) 24293-00
Includes: (1) 14033-32, (1) 21066-69

Description	Quantity Required Per Test	Units	Cat. No.
Cyclohexanone	0.5 mL	100 mL MDB	14033-32
ZincoVer 5 Reagent Powder Pillows	1 pillow	100/pkg	21066-69

REQUIRED APPARATUS

Pipet, serological, 10 mL	1	each	532-38
Pipet Filler, safety bulb	1	each	14651-00
Sample Cell, 10-20-25 mL, w/cap	2	6/pkg	24019-06
Squeezers, plastic dropper	1	20/pkg	21247-20

OPTIONAL REAGENTS

Bleach, household	1 gal	buy locally
Cylinder, graduated, mixing, 25mL	each	20886-40
Hydrochloric Acid Standard Solution, 6 N	500 mL	884-49
Nitric Acid, ACS	500 mL	152-49
Nitric Acid 1:1	500 mL	2540-49
Sodium Hydroxide Standard Solution, 5.0 N	50 mL SCDB	2450-26
Water, deionized	4 L	272-56
Zinc Standard Solution, 100 mg/L Zn	100 mL	2378-42
Zinc Standard Solution, PourRite ampule, 25 mg/L as Zn, 2mL	20/pkg	14246-20

OPTIONAL APPARATUS

Ampule Breaker, PourRite ampules	each	24846-00
Aspirator, vacuum	each	2131-00
Beaker, glass, 1000 mL	each	500-53
Cylinder, graduated, 100 mL	each	508-42
Cylinder, graduated, mixing, 250 mL	each	26362-46
Filter discs, glass, 47 mm	100/pkg	2530-00
Filter holder, 47 mm	each	2340-00
Flask, erlenmeyer, 250 mL	each	505-46
Flask, filtering, 500 mL	each	546-19

OPTIONAL APPARATUS (continued)

Description	Units	Cat. No.
Flask, volumetric, Class A, 100 mL	each	14574-42
Flask, volumetric, Class A, 1000 mL	each	14574-53
Hot plate, micro 115 V	each	12067-01
Hot plate, micro 230 V	each	12067-02
pH paper, 1 to 11 pH	5 rolls/pkg	391-33
pH meter, *Sension*™*1*, portable with electrode	each	51700-10
Pipet filler, safety bulb	each	14651-00
Pipet, serological, 2 mL	each	532-36
Pipet, TenSette, 0.1 to 1.0 mL	each	19700-01
Pipet, TenSette, tips for 19700-01	50/pkg	21856-96
Pipet, TenSette, 1.0 to 10.0 mL	each	19700-10
Pipet, TenSette, tips for 19700-01	1000/pkg	21856-28
Pipet, TenSette, tips for 19700-10	50/pkg	21997-96
Pipet, TenSette, tips for 19700-10	250/pkg	21997-25
Pipet, volumetric, Class A, 5.00 mL	each	14515-37
Pipet, volumetric, Class A, 0.5 mL	each	14515-34

For Technical Assistance, Price and Ordering

In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.